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Supreme Court of the United States

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No. 7 Original, October Term, [redacted] 1944

THE STATE OF NEBRASKA,
Complainant,

vs.

THE STATE OF WYOMING,
Defendant,

and

THE STATE OF COLORADO
Impleaded Defendant.

THE UNITED STATES OF AMERICA,
Intervenor.

REPORT OF MICHAEL J. DOHERTY, SPECIAL MASTER.

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REPORT OF MICHAEL J. DOHERTY, SPECIAL MASTER.

By order of this Court of October 14, 1935, the undersigned was appointed Special Master to take evidence, make findings of fact and conclusions of law, and submit recommendations for a decree (296 U. S. 542). In compliance with that order I took the evidence submitted by the parties, examined their briefs, heard their oral arguments, and herewith submit a record of the evidence and my report.

To receive the evidence hearings were held at various places in Nebraska and Wyoming and at Denver, Colorado, extending over a period of five and a half years. The record

consists of 29,500 typewritten pages of oral testimony and 1,288 exhibits, varying in length from pages to sizable volumes. A detailed review of the procedure in taking the evidence is appended to part II hereof, beginning on page 272, captioned "Review of Proceedings".

PLAN OF REPORT.

The report is in two parts. Part I covers (1) parties and pleadings, (2) definition of terms, (3) summary of conclusions, (4) water law of the litigating states, (5) a general survey of the river basin, its physical and climatic conditions, (6) a brief history of the growth of irrigation and of the storage of water, (7) some discussion of the general background and circumstances of the liigation, (8) a section by section analysis of irrigation and water production, consumption, requirements, and priorities, with sufficient detail for an understanding of the basis of the conclusions reached, (9) position and proposals of parties, (10) Nebraska's theory of case,—her damage, (11) law of the case, (12) criticism of proposals of parties, (13) problems and alternatives, (14) specific conclusions as to equitable apportionment in respect to each river section, (15) recommendations for a decree. Part II contains a more detailed review of the evidence on several controverted matters, a discussion of several issues of law, a review of the procedure in taking the evidence and an alphabetical index. There may be little occasion to refer to Part II except in the consideration of specific issues raised by exceptions to the report.

PART I.

PARTIES AND PLEADINGS.

The suit was commenced in October, 1934, with the filing, pursuant to leave of the Court, of a bill by the State of Nebraska against the State of Wyoming alleging that Wyoming, by her diversions of water from the North Platte River for use in irrigation, including incidental storage, was, as between that state and Nebraska, violating the rule of priority of appropriation in force in both states and depriving Nebraska of water to which she was equitably entitled. The prayer of the bill was for a determination of the equitable share of each state in the water of the river and of the priorities of all appropriators in both states, and for an injunction restraining the alleged wrongful diversions and storage by Wyoming. A motion by Wyoming for dismissal on the ground that the State of Colorado and the Secretary of the Interior of the United States were necessary parties was denied (295 U. S. 40). Wyoming then filed her answer and an amended and supplemental answer denying the diversion, storage, or use of any water to which Nebraska was equitably entitled and joining in the prayer of Nebraska for an equitable apportionment and praying for the impleading of the State of Colorado upon the grounds, among others, that the headwaters of the river were in Colorado and were threatened with large depletion in that state; that the relative rights of Colorado and Wyoming had never been determined, and that an equitable allocation of the water of the interstate stream between Nebraska and Wyoming could not properly be made without a determination of the rights of the State of Colorado and her appropriators. The motion to

implead Colorado was granted (296 U. S. 553). That State filed her answer, together with a cross-bill against Nebraska and Wyoming, in which she denied any use or threat of use of water of the river beyond her equitable share, and prayed for an equitable apportionment between the three States, excepting only the tributary water of the South Platte and Laramie Rivers, alleged to have been previously apportioned—the former between Colorado and Nebraska by compact, the latter between Colorado and Wyoming by decree in the case of *Wyoming v. Colorado*, 259 U. S. 496. By further answers and replications issue was fully joined between the three States.

After the taking of evidence had proceeded for some time, and on March 31, 1938, the United States moved for leave to intervene, asserting ownership of the unappropriated waters of the river and the "reservation" by it of water for two Federal reclamation projects known as the North Platte Project and Kendrick Project. In the alternative it asserted a right to water for these projects as an appropriator under the laws of Wyoming and Nebraska. The petition for leave to intervene was granted (304 U. S. 545) upon the conditions that the evidence previously received should stand as against the United States and that the order permitting the intervention should be without prejudice to the determination on final decree of any of the substantive questions of law or fact advanced or to be advanced by any of the parties. The three States, by their answers to the petition in intervention, joined issue with the United States and, after the interruption occasioned by the intervention proceeding, the taking of testimony was resumed.

DEFINITION OF TERMS.

The following terms belonging to the language of the irrigation industry are frequently used herein.

An "acre foot" is that quantity of water which will cover one acre of land to the depth of one foot. It is the equivalent of 43,560 cubic feet.

"Second foot" is an abbreviated expression for "one cubic foot per second of time". It is a unit of measurement of the flow of water.

"Natural flow" or "direct flow" refers to all water in a stream except that which comes from storage water releases.

"Consumptive use" refers to the water lost by evaporation and transpiration in the course of irrigation use. It is represented by the difference between the water diverted and that which returns to the stream.

"Return flow" is the residual which returns to a stream of water which has been diverted and applied to land in irrigation. It may be "visible" or "invisible" depending upon whether it takes the form of surface flows or underground percolation.

"Duty of water" means the utility of water for irrigation under given conditions; its potency to satisfy particular irrigation needs. It is reflected in the quantity (expressed in unit rate or total) essential to the irrigation of a given area of land.

"Irrigation requirement" is the quantity of water, exclusive of precipitation, (including unavoidable wastes) that is required for crop production.

A "spill" in reference to a reservoir is the overflow through a spillway due to inflow after storage capacity

has been reached. The term is also sometimes used broadly to denote the presence of excess, uncontrollable water in any river section.

"Water year" as used herein means the twelve months between and including October 1 of each year and September 30 of the following year. This is the water year of Nebraska, Wyoming and Colorado, and is the standard water year employed by The United States Geological Survey.

There will be many references to the priorities, requirements, and supplies of "canals". In such instances the word "canal" is used as representative of the lands under or served by the canal.

REFERENCES TO THE RECORD.

In Part I all references to the record are made in footnotes. Figures preceded by the letter "R" refer to pages of the record. Those following the initial of the name of a state refer to exhibits, for example, "N-72" refers to Nebraska's Exhibit No. 72. In Part II these references will sometimes appear in the body of the text enclosed in parenthesis with omission of the "R" preceding page numbers.

The so called "Engineers Stipulation" is a stipulation between the parties embodying certain data assembled and agreed upon by the engineers. It is filed with this report in the manner of an exhibit.

SUMMARY OF CONCLUSIONS.

For the purpose of a study of water resources and distribution, the basin of the North Platte and Platte Rivers

falls into several natural sections as appears from the various engineering studies presented. The evidence deals largely with sectional requirements, supplies and allocations. As generally agreed upon the sections are:

(1) North Park Colorado;
(2) Colorado-Wyoming State Line to Pathfinder Reservoir;
(3) Pathfinder Reservoir to Whalen, Wyoming;
(4) Whalen, Wyoming to Tri-State Dam, Nebraska;
(5) Tri-State Dam to Kingsley Reservoir;
(6) Kingsley Reservoir to Grand Island.

There is also a time division of special significance. In 1930 began a period of extraordinary drouth in the entire North Platte and Platte River Valleys which has since continued and which has been accompanied by severe shortages of water throughout the three states. This was undoubtedly one of the main factors in the precipitation of the present litigation. The claim of Nebraska is based essentially on what has transpired during this period and the threats predicted for the future.

Colorado and Wyoming and also Nebraska (at least as to the portion of that state concerned in this suit) have adopted and apply the principle of water law known as "priority of appropriation". Priorities however have been applied only in intra-state administration. Neither of the upper states has ever recognized, as a limitation upon her uses of water, the priorities of a lower state. By appropriations in the three states the dependable natural flow of the North Platte River, during the irrigation season, has long been overappropriated.

My basic conclusions respecting the equities of the parties and concerning apportionment are:

1. The water of the Laramie River was equitably distributed by the decision of this Court in the case of *Wyoming v. Colorado,* 259 U. S. 419, and that of the South Platte River was equitably distributed by compact between Nebraska and Colorado ratified by the Congress in 1926. This conclusion takes into account the interests of all parties and no redistribution of the waters of those rivers should be undertaken in this suit.

2. It has not been made to appear that prior to 1930 Colorado or Wyoming withdrew from the river more than their equitable shares of its water.

3. Whether since 1930 these states have exceeded their equitable shares depends upon the effect which is to be given the principle of priority of appropriation as between the states. Unless the equitable shares of the states are to be measured primarily by an interstate application of the priority rule then there is no clear basis in the evidence for a finding that Nebraska has received less than her equitable share or the other states more. On the other hand if priorities are to control then both Colorado and Wyoming have during the period overpassed their limits for they have taken water in substantial quantities which on an interstate priority basis would have gone to Nebraska. The weight to be given priorities in determining the equities of the states depends largely upon the construction and applicability of the decision in *Wyoming v. Colorado* 259 United States, 419, and the guidance to be be drawn from the reasoning of the opinion in *Colorado v. Kansas,* 320 U. S. 383.

4. Neither the equitable shares of the states nor the matter of apportionment by decree ought in this case be determined solely upon the basis of priorities. A decision could not be so reached that would be wholly equitable. However, priorities are in my view one of the principle factors—perhaps the most important single factor—determinative of equitable apportionment.

5. Lands in Nebraska supplied by diversions below the so-called Tri-State Dam[1] have no equitable claim upon direct flow water originating in Wyoming or Colorado. This results from the fact that their needs are reasonably satisfied from local sources of supply. The claim of Nebraska is thus reduced to that asserted on account of a group of canals diverting near the state line, usually referred to as the "State Line Canals", and on account of lands supplied by the so-called North Platte Project Canals whose headgates are located at Whalen, Wyoming.

6. Equity does not require any restriction upon or interference with present uses of water by Colorado within the North Platte Basin in North Park or any reduction in the present rate of transbasin exportation from North Park. It does require restraint of any further expansion of irrigation from the river or its tributaries in North Park or any increase in the transbasin diversions during present or comparable conditions of water supply.[2]

7. Equity does not require any restriction upon or interference with present uses of water in the North Platte Basin in Wyoming between the Colorado-Wyoming state line and Guernsey (or Whalen), Wyoming. It does require, during present or comparable conditions of water

[1]Located about a mile below the Wyoming-Nebraska State Line.
[2]By "present" conditions is meant those which have prevailed generally since 1930.

supply, restraint of any further expansion of irrigation from the river or its tributaries between the Colorado-Wyoming state line and Pathfinder Reservoir or from the main river in the section between Pathfinder Reservoir and Guernsey. This is exclusive of the Kendrick Project which requires separate consideration.

8. Equity requires that the Federal Government's North Platte Project and Kendrick Project be operated according to the rule of priority with relation to each other and with relation to all senior appropriations downstream to and including the Nebraska state line canals.

9. The short river section (about 42 miles) between Whalen, Wyoming, and the Tri-State Dam in Nebraska presents a special situation calling for special analysis and treatment. Here is concentrated the greatest demand and the largest diversions of both natural flow and storage water on the entire river. It is a particular center of controversy and presents problems of unusual difficulty. Recognizing that storage water must be left for distribution in accordance with the contracts relating thereto, a recommendation will be made for an allocation between Wyoming and Nebraska on the basis of certain proportions of the daily natural flow.

10. The foregoing conclusions 6, 7, 8 and 9 assume that an apportionment now made should be based primarily upon the conditions of water supply which have prevailed since 1930. Recommendation is further made of retention by the Court of jurisdiction to amend the decree upon a showing of such change of conditions as might render the operation of the decree inequitable. This recommendation contemplates particularly the possibility of the passing of the present drouth cycle and the future availability of far greater water

supplies, comparable with those of former years which might justify a release of some or all of the restrictions now proposed. Many elements of uncertainty and probable impermanence in the present situation argue either for a dismissal of the suit or a decree with provision for such retention of jurisdiction. The reasons favoring a decree appear the stronger.

10. The position of the United States (or the Secretary of the Interior as representative of the United States) is that of an appropriator of water for storage under the laws of Wyoming. Its interests in that connection are represented by the state of Wyoming. No separate allocation to it would be proper in any scheme of apportionment. Unquestioned however is its ownership and authority in the operation of the storage and power plants, works, and facilities pertaining to its Reclamation Projects. What interest it may have in any unappropriated water is an academic question not involved in a decision of the suit.

WATER LAW OF LITIGATING STATES.

In Colorado and Wyoming the doctrine of priority of appropriation has always prevailed to the exclusion of riparian rights. It was established, or more correctly speaking perhaps, was confirmed, by the constitutions and statutes of both States. Even in the territorial days, and before the first statuory enactments on the subject, the rule of appropriation was recognized, originating in and resting upon custom and usage as being the only rule suitable to the climate and conditions of the country. *Wyoming v. Colorado,* 259 U. S. 419, 465; *Constitution of Colorado,* Art. XVI, Sec. 5; *Farmers Highline Canal Co. v. Southworth,* 13 Colo. 111, 21 P.

1028; *Swernberger v. Seaton Co.*, 45 Colo. 401, 102 P. 168; *Ft. Collins Milling Co. v. Larimer & Weld Irrigation Co.*, 61 Colo. 45, 156 P. 140; Wyoming Constitution, Art. VIII, Sec. 3; *Wyoming Compiled Statutes, 1931*, Secs. 122, 401, 418-419; *Moyer v. Preston*, 6 Wyo. 308, 44 P. 845.

While there is no question as to the Colorado and Wyoming rule, there is some dispute as to whether Nebraska can properly be regarded as an appropriation State, so that all three States can be said to have a common system of water rights. This requires some examination of the history and development of Nebraska water law.

Nebraska was originally a riparian doctrine State. The earliest settlement was of the eastern portion of the State, where humid conditions prevailed and irrigation was not a matter of economic or legal concern. No common law right of appropriation was recognized. *Meng v. Coffey*, 67 Neb. 500, 93 N. W. 713. When the movement of population reached westward to the more arid portions of the State, the need of diversion and use of water for irrigation became compelling and prompted various statutory enactments providing for a system of appropriation and priorities. The first statute relating to irrigation was an Act of 1877, giving irrigation and power companies the right of eminent domain. In 1889 a further Act[1] was adopted authorizing and regulating the appropriation of water from flowing streams and establishing the principle that "as between appropriations, the one first in time is first in right". In 1895 a complete code[2] of water law was enacted, providing:

"Sec. 42. The water of every natural stream not heretofore appropriated within the State of Nebraska

[1]Laws 1889, c. 68.
[2]Laws 1895, c. 248.

is hereby declared to be the property of the public and is dedicated to the use of the people of the state subject to appropriation as heretofore provided.

"Sec. 43. The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purposes. * * *"

In 1920 Nebraska adopted a new Constitution. It contained broad declarations confirming the principle of priority of appropriation. They are contained in Article XV, Secs. 4, 5, and 6. Section 6 reads in part:

"The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied except when such denial is demanded by the public interest. Priority of appropriation shall give the better right as between those using the water for the same purpose. * * *"

The effect of these statutory and constitutional provisions has been the subject of a number of decisions by the Supreme Court of Nebraska. It has uniformly been held that riparian rights were not extinguished. If vested prior to the adoption of the rule of appropriation, they were not and could not be destroyed without compensation. *Clark v. Cambridge & Arapahoe Irrigation & Improvement Co.*, 45 Neb. 798, 64 N. W. 239; *Crawford County v. Hathaway*, 60 Neb. 754, 84 N. W. 271, 61 Neb. 317, 85 N. W. 303, 67 Neb. 325, 93 N. W. 781; *Osterman v. Central Nebraska Public Power & Irrigation District*, 131 Neb. 356, 268 N. W. 334.

However, it appears that appropriation rights are regarded as superior to riparian rights; that riparian rights may be condemned in favor of appropriators, and that diversions

by appropriators, even though in violation of riparian rights, will not be enjoined, the only remedy for the violation being compensation or damages. *Cline v. Stock*, 71 Neb. 70, 98 N. W. 454; on rehearing, 102 N. W. 265; *McCook Irrigation & Water Power Co. v. Crews*, 70 Neb. 115, 102 N. W. 249.

In the North Platte and Platte River basins in Nebraska west of Kearney, rights of appropriation have long been entrenched and appear not to be much opposed by riparian claims either within or below that section. The rights asserted by Nebraska in this suit are based wholly on the appropriation system and upon appropriations perfected, recognized, and enforced under Nebraska law by the Nebraska Water Administration. With respect to those rights Nebraska stands in a position comparable with that of Wyoming and Colorado in respect to similar rights existing under the laws of the latter states. The appropriation system being dominant in the Nebraska area involved in this suit, the fact that the riparian rule may still prevail elsewhere in the State would not appear to be of controlling significance.

PROCEDURE FOR APPROPRIATION OF WATER.

The modern statutory procedure for the acquisition of rights of appropriation differs considerably among the three states.

In Nebraska an appropriation is initiated by the filing of an application with an executive department known as the Department of Roads and Irrigation. Formerly the same powers were exercised by the Department of Public Works. If action upon the application be favorable, the priority dates from its filing. The appropriation is thereafter per-

fected by construction of the irrigation works, which must be commenced within six months after the approval, and application of water to the land with reasonable diligence. When it appears to the satisfaction of the Department that the appropriation has been perfected, a certificate of appropriation is issued. Appropriations are subject to several limitations: (1) capacity of the diversion works and canal; (2) beneficial use; (3) (since 1895) one second foot of flow for each 70 acres irrigated; and (4) (since 1911) three acre feet per acre per calendar year. The specific limitations do not now apply to storage water. Appropriative rights attach to the land.[1]

In Wyoming the procedure commences with the filing of an application for permit with the State Engineer. Approval by the State Engineer has the effect of a permit upon the condition subsequent that construction work shall be commenced within one year and completed within five years of date of approval, these limitations being subject to extension. When the construction work is completed and water applied, proofs must be submitted by the appropriator to the Board of Control. If found satisfactory, the Board issues the appropriator a certificate of appropriation designating as the priority date the filing date of the application. The limitations upon appropriations are one second foot of flow for each 70 acres irrigated and the principle of beneficial use. The rights are appurtenant to the land.[2]

The Colorado statute contemplates the possible undertaking of construction of irrigation works before any formal procedural steps are taken. The appropriator is required, within sixty days from commencement of construc-

[1]Neb. Comp. Stats., 1929, Chap. 81, Secs. 6301-6331; Chap. 46.
[2]Wyo. Rev. Stats. 1931, Chap. 122, Secs. 117, 401-421.

tion, to tender a statement of claim to the State Engineer, who, if he finds it in conformity with legal requirements, accepts it for filing. Periodically, or upon petition, an adjudication proceeding is held in the District Court, in which the Court hears evidence and passes upon all unadjudicated appropriation claims and renders a decree adjudicating the appropriations and assigning to each by number its priority position in relation to all others. The priority date relates back to the earliest time of "open and notorious physical demonstration" of a purpose to appropriate and divert water.[1] The filing of a statement of claim is prima facie evidence of such purpose. Appropriative rights are limited to beneficial use, but in contrast with Nebraska and Wyoming there are no specific limitations upon diversions prescribed by statute. The matter is left to the discretion of the Court. In practice, the limits fixed by court decrees have averaged one second foot for each 20 acres. Also, in contrast with Nebraska and Wyoming, the appropriative rights do not attach to the land. Water decreed to one ditch may be transferred to another.[2]

GENERAL FACTS.

The River.

The North Platte River is an innavigable interstate stream flowing wholly within the States of Colorado, Wyoming, and Nebraska. It rises in the mountainous region of northern Colorado known as North Park, which is substantially coincident with Jackson County in that state. From North Park its course is northerly, skirting the eastern slope of

[1]Fruitland Irrigation Company v. Kruemling, 62 Colo. 160, 162 Pac. 161.
[2]Col. Stats. Ann., 1935, Chap. 90, particularly Secs. 27, 31, 32, and 155.

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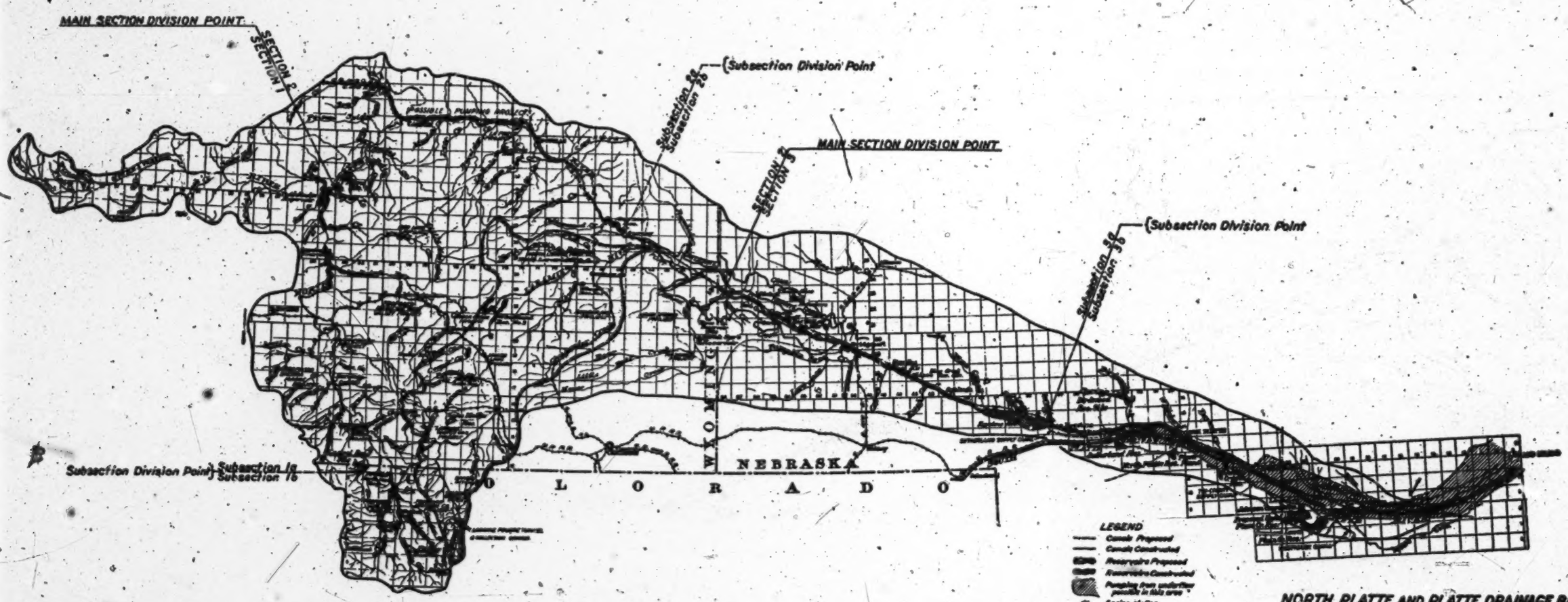

NORTH PLATTE AND PLATTE DRAINAGE BASIN
ABOVE GRAND ISLAND, NEBRASKA

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the Continental Divide, entering southeastern Wyoming about eighty miles west of Cheyenne, and continuing in a northerly direction to the vicinity of Casper, where it turns directly eastward across the Great Plains and proceeds easterly and southerly, reaching the Nebraska state line near Henry in that state and continuing without change of direction to the city of North Platte, where it is joined by the South Platte coming in from the west, forming the Platte River.[1] The Platte then flows southeasterly to Kearney, northeasterly to Fremont, and thence southeasterly until it empties into the Missouri River at Plattsmouth, near the western border of Iowa.

A small scale map reproduced on the opposite page portrays the course of the North Platte and Platte Rivers from the source of the North Platte to Grand Island, Nebraska. It also shows the principal tributaries, the reservoirs, and some canals. It is a photostatic copy of a map accompanying a brief of the United States, and is intended to furnish a general sectionalized picture of the basin without particular attention to accuracy of detail.[2]

From North Park the North Platte River is a rapidly flowing stream which courses through a relatively narrow valley until it reaches eastern Wyoming, where it gradually broadens out, with accompanying loss of velocity. Proceeding through western and central Nebraska the channel becomes very wide, ranging from 3,000 to more than 6,000 feet. Frequently it divides into small channels separated by sand bars or islands, and in times of low water the stream becomes lost in the deep sands which form its bed. In these stretches it has become familiarly characterized as being "two miles wide and one inch deep".

[1]The South Platte is not treated herein as a tributary of the North Platte.
[2]For large scale map see N-1; other maps U. S.-117, N-23 (showing gaging stations) and C-4-5.

The river length of the North Platte within each of the three States is approximately as follows: Colorado, 70 miles; Wyoming 435 miles, and Nebraska, 183 miles. The Platte River, from North Platt to Grand Island in Nebraska, has a length of about 180 miles. Grand Island is significant as marking the eastern limit of irrigation on the Platte. The suit therefore involves (or did according to the allegations of the pleadings and the scope of the evidence) the entire North Platte River and a section of the Platte River 180 Miles in length, or a total river length of approximately 820 miles.[1]

The drainage area of the North Platte River, exclusive of its tributary, the Laramie River, is about 28,000 square miles, divided as to States as follows:[2]

Colorado.....	1,630	square miles	(6%)
Wyoming	17,540	" "	(63%)
Nebraska	8,730	" "	(31%)
Total	27,900	" "	(100%)

The river basin, including the North Platte and Platte, is divisible into several natural sections, to which repeated references will be found in the studies and testimony of the engineers and other witnesses. They are:[3]

(1) North Park Colorado;

(2) Colorado-Wyoming State Line to Pathfinder Reservoir;

(3) Pathfinder Reservoir to Whalen, Wyoming;

Wyoming;

[1] C-72, 131, N-103; R. 6233-7.
[2] C-70, 71.
[3] These sections correspond with those shown on the map page 17, except that some of them appear on the map as subsections. The section from Kingsley Reservoir (named Keystone on the map) to Grand Island is sometimes subdivided at North Platte.

(4) Whalen, Wyoming to Nebraska State Line (or Tri-State Dam);

(5) Nebraska State Line (Tri-State Dam) to Kingsley Reservoir;

(6) Kingsley Reservoir to Grand Island.

It will develop that the third and fourth sections are the ones about which the problem in the case particularly revolves, the third because of its relation to the water supply and the fourth by reason of its relation to the demand. In the third section is installed a huge reservoir system and in the fourth is concentrated the heaviest demand on the entire river.

The source of the headwaters of the North Platte River in North Park is the mountain snows which melt in early summer, producing a run-off which gathers in the main tributaries, such as North Fork, Roaring Fork, Little Grizzly, Big Grizzly, Illinois, Michigan, Canadian, and other creeks and streams, all of which unite to form the North Platte River.[1] Other tributaries heading in North Park join the main river below the Wyoming State Line, the principal of which are Encampment River and Big Creek.

During the forty-five years period 1895 to 1939 the average annual contribution of Jackson County, Colorado, to the water of the North Platte River was 635,100 acre feet. This is the original production before irrigation depletion.

The river section from the Wyoming State Line to Pathfinder Reservoir is one of large accretion, the two major tributaries being the Medicine Bow River, emptying into Seminoe Reservoir, and the Sweet Water River, emptying into the Pathfinder Reservoir. In addition numerous creeks and small streams augment the inflow. The average annual

[1]For maps showing the formation of the river in North Park, see Colorado Exhibits 6 and 34.

contribution to the river of water originating in this section during the forty-five years period was 1,059,240 acre feet.

In the Pathfinder to Whalen section the tributary accretions are relatively small, the average for the forty-five years period being 390,000 acre feet. From Whalen, Wyoming, to the Nebraska state line, a distance of 42 miles, the average annual contribution, including the Laramie, was for the period 281,940 acre feet.

The first Nebraska section of 140 miles from the state line to the Kingsley Reservoir made the large contribution of 1,027,890 acre feet annually. Between the latter point and Grand Island another increment of 308,200 acre feet was added.

Summarized by States, the above contributions to the river system by way of original production of water in acre feet and percentages are as follows:[1]

Colorado	819,220[2]	21%
Wyoming	1,731,600[3]	45%
Nebraska	1,336,090[4]	34%

The volume of river flow varies largely in the different sections. This is because of the continuously occurring gains and losses due to tributary contributions and return flows on the one hand and depletion from irrigation and channel losses on the other. The best single index on the river is the run-off at the Pathfinder Reservoir. Here the main accretions of Colorado and Wyoming are already in the river and the natural flow is not yet appreciably distorted by storage releases, as is the case below Pathfinder.

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[1] C-128, 158, 167.

[2] Including an estimated annual contribution to the Laramie River of 184,120 acre feet.

[3] Including Laramie River.

[4] Includes Platt River to Grand Island. For North Platte only, percentages would be 23, 48 and 29. But see N-84-86, R. 360-370.

The annual flow at Pathfinder for each of the 37 years, 1904-1940, was as follows:[1]

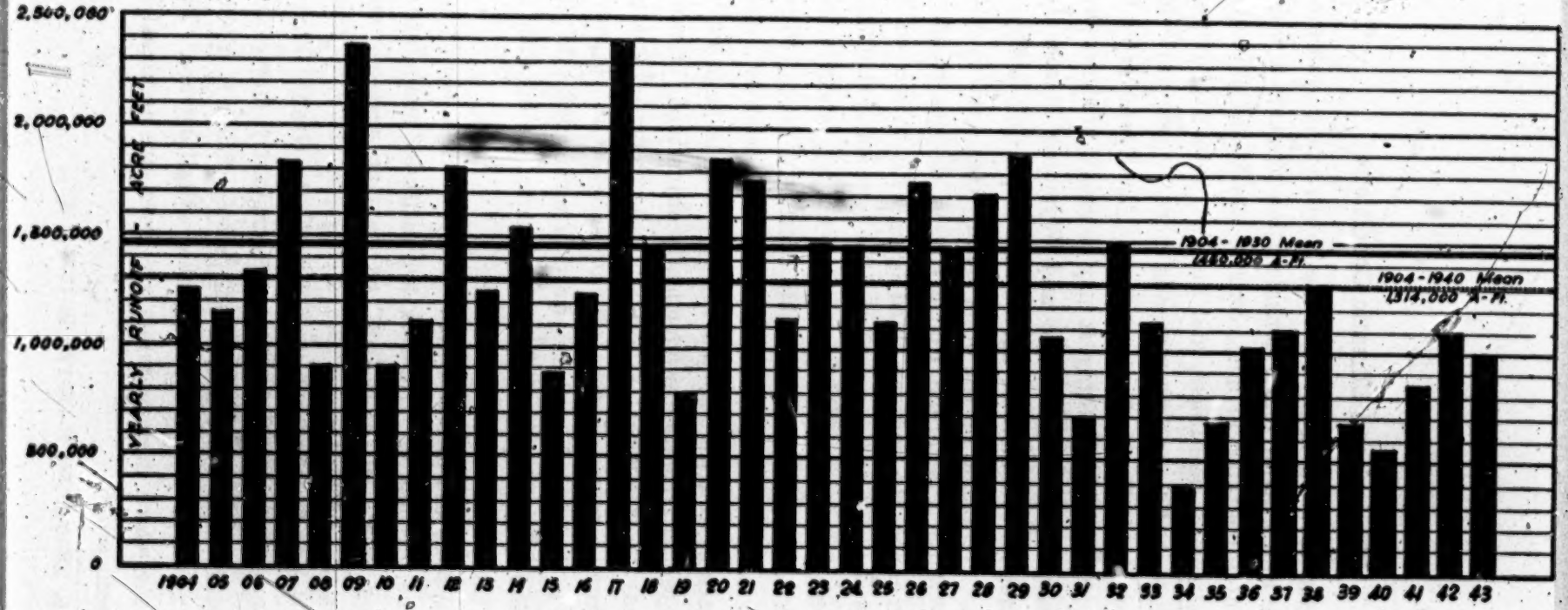
Year	Acre Feet
1904	1262000
05	1159400
06	1351000
07	1851100
08	918600
09	2381800
1910	918100
11	1123400
12	1820500
13	1265000
14	1550[illegible]0
15	900200
16	1253400
17	2399400
18	1486100
19	859700
1920	1870100
21	1782000
22	1148200
23	1500800
24	1489900
25	1244700
26	1776500
27	1456200
28	1725400
29	1902700
1930	1072800
31	706300
32	1506600
33	1140500
34	382200
35	696200
36	1045600

[1]Engineer's Stipulation, p. 11.

37	1130600
38	1334900
39	698200
1940	569800

The flow of these years, with that of 1941, 1942, and 1943 added, is depicted by the graph on the opposite page[1]. As will be observed, the flows show very wide fluctuations from year to year. The maximum was in 1917 with 2,399,400 acre feet, the minimum in 1934 with 382,200 acre feet; the average for the 37 years was 1,315,900. Wide fluctuations occurred not only from year to year but also from month to month and even from day to day. A glance at the portion of the graph covering the years 1930 to 1943 will readily disclose one of the underlying conditions which precipitated the present litigation.

[1]The graph is from Nebraska's Exhibit 24, supplemented to include the years 1936 to 1943, inclusive. The mean 1904-1935 line on the exhibit is omitted and lines indicating the means of the 1904-1930 and 1904-1940 periods are added. The evidence closed in 1941, and the data for that year and the two following years depends upon judicial notice of the records of the U. S. Reclamation Service or the Biennial Reports of the Nebraska Department of Roads and Irrigation for those years. There was a general stipulation subjecting these reports to judicial notice but without specific reference to the years 1941-1943. (R. 14443, 14730-4, 14791-5).



RUNOFF NORTH PLATTE AT PATHFINDER DAM
YEARLY VALUES IN ACRE-FEET OCT. 1 TO SEPT. 30

Physical and Climatic Conditions.

The region through which runs the North Platte and section of the Platte River under consideration presents a wide diversity of topographical and climatic conditions directly affecting the need, usefulness, and duty of water for irrigation. These conditions follow trends more or less uniform in direction from North Park, Colorado, to Grand Island, Nebraska. Generally speaking, it may be said that the entire North Platte basin in Colorado and Wyoming is strictly arid, so that no considerable agriculture is possible without irrigation. Nebraska, on the other hand, from west to east along the North Platte and Platte Rivers, divides roughly into three zones, the western third being arid to semi-arid, where irrigation is indispensable to the type of agriculture carried on, the middle third being sub-humid, where some crops can be raised with reasonable success without irrigation, but where lack of irrigation would seriously limit diversification, and the eastern third, which is sufficiently humid to render irrigation economically unjustified. Grand Island may be considered as marking the eastern limit of the sub-humid zone. These belts or zones tend to move eastward in dry periods and westward in wet cycles. On the average the humid zone is probably unequal in breadth to either of the other two.[1]

The physical and climatological elements most vitally affecting the problem of irrigation are altitude, temperature (including length of "frost-free" or growing season), and precipitation. Along the downward course of the river from the headwaters in North Park, Colorado, to Grand Island, Nebraska, the trend of elevation is constantly downward, while the trend of temperature and precipitation is almost steadily upward. The following table will illustrate. The stations for which measurements are given are arranged in downstream order.

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[1] C-79-87; R. 23510-23554; N-174-178; R. 1078-1154.

TABLE I

TOPOGRAPHICAL AND CLIMATOLOGICAL DATA RELATING TO THE NORTH PLATTE AND PLATTE RIVER BASINS—CAMERON PASS, COLORADO, TO GRAND ISLAND, NEBRASKA

Station	Distance Downstream from Cameron Pass	Elevation—Miles Above Sea Level	Mean Temperature (Degrees Fahrenheit) Annual	Mean Temperature (Degrees Fahrenheit) Seasonal	Mean Precipitation (Inches) Annual	Mean Precipitation (Inches) Seasonal	Average Growing Season (Days)
COLORADO							
Cameron Pass		10,285					
Spicer		8,300	36.9	57.9	11.31	2.35	61
Northgate	66	7,800					
State Line (Colo.-Wyo.)	70	7,700					
WYOMING							
Encampment	112	7,320	41.9	61.1	12.43	3.87	108
Saratoga	127	6,800	41.3	61.4	10.61	3.15	96
Pathfinder Dam	252	5,735	45.4	64.4	10.34	4.73	129
Casper	312	5,124	47.2	65.1	14.76	5.92	136
Douglas	382	4,815	45.5	64.3	13.78	6.06	124
Whalen	467	4,300					
Ft. Laramie		4,715	47.0	66.0	14.80	7.26	125
State Line (Wyo.-Neb.)	507	4,000					
NEBRASKA							
Mitchell	522	4,080	47.2	66.1	14.18	8.64	135
Scottsbluff	532	3,888	48.6	67.1	16.18	8.85	136
Bridgeport	567	3,658	48.4	67.3	15.78	8.70	135
North Platte	702	2,821	49.9	67.6	18.31	12.60	159
Gothenburg	738	2,557	50.5	69.0	21.69	14.11	150
Kearney	799	2,146	50.5	69.0	23.25	15.97	159
Grand Island	837	1,860	51.1	69.7	25.98	17.91	162

HISTORY AND EXTENT OF IRRIGATION.

The beginning of irrigation in the Basin goes back to about 1865. The earliest projects appear to have been in eastern Wyoming and western Nebraska, with some efforts in the basin of the Laramie. The first ventures were on the smaller tributaries, where by crudely constructed dams and ditches water was diverted to individual tracts lying close to the streams. Irrigation on an important scale began in the decade between 1880 and 1890. This is true as to each of the three States. The oldest priorities asserted in this suit are: Colorado, May 7, 1881; Nebraska, September 10, 1882; Wyoming, November 1, 1882.

For the first thirty years, or until 1909, irrigation in the three States was from the natural flow of the river by direct diversions and use. Storage of water for irrigation had been negligible. There was therefore available for irrigation only the flow which occurred during the irrigation season. Out-of-season flows were not conserved, but ran off unused. The enterprises were usually small and privately financed, sometimes representing individual and sometimes cooperative efforts. During the earlier years, and up to about 1909, the development in Colorado and Wyoming was relatively more rapid than in Nebraska. Development in Nebraska east of the extreme western area was retarded by two factors: (1) lack of dependable supply rendered progressively more inadequate by depletion during irrigation season in the upper States and in the Nebraska western border area and (2) the frequent occurrence of a succession of wet years permitting successful farming without the aid of irrigation. This led to the alternating abandonment and revival of many irrigation projects.

Excluding the Laramie Basin, the acreages under irrigation in the three States at intervals of ten years from 1880 to 1939 were as nearly as they may be arrived at as follows:[1]

	Colorado	Wyoming	Nebraska[2]	Total
1880	200	11,000		11,200
1890	44,500	86,000	15,300	145,800
1900	83,500	169,100	105,690	358,290
1910	113,500	224,500	192,150	530,150
1920	129,140	265,375	306,930	701,445
1930	130,540	307,105	371,300	808,945
1939	131,810	325,720	383,355	840,885

From these figures it will be seen that during the last thirty years, and since 1910, while the acreage irrigated in Colorado increased but 14 per cent, that of Wyoming increased 31 per cent, and that of Nebraska substantially 100 per cent. While this large and disproportionate increase in Nebraska may have been somewhat influenced by other factors, it is mainly attributable to the use of storage water from the Pathfinder Reservoir of the North Platte Project (next to be discussed) both by way of direct application and use of return flows. Of an increase since 1910 of 174,650 acres irrigated from the main river, 104,000 acres are North Platte Project lands. The remaining 70,650 acres were brought under irrigation largely with supplies provided by return flow waters which developed from the operation of the project.

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[1]This tabulation is made up from Colorado's Exhibit 118. This represents a study by the Colorado Water Conservation Board under the direction of its chief engineer, Mr. C. L. Patterson. While a margin of error must be expected in any such study and the results of this one vary from the irrigation figures shown in the United States census and other official reports, and in some respects from the findings in this report, the exhibit reflects a carefully considered analysis and is the most comprehensive study of this subject to be found in the record. For other data on acreages irrigated, see C-106-107, 108, and 118; N-37 to 45; U. S.-204B, 204C, and 204D (Irrigation Census of 1940).

[2]Does not include approximately 65,000 acres now irrigated from the Platte River between North Platte and Kearney. For figures including this and certain other land, see p. 37.

STORAGE OF WATER.

North Platte Project.

The history of irrigation on the river entered a new phase shortly after the adoption by Congress in 1902 of the Federal Reclamation Act.[1] One of the early reclamation projects undertaken by the Secretary of the Interior under that Act was the so-called "North Platte Project", designed for the reclamation and irrigation of large areas of land in the North Platte basin in eastern Wyoming and western Nebraska.[2] The project works include several storage reservoirs, diversion works, canals, and two hydroelectric power plants. Work was begun in February, 1905. The first unit was the Pathfinder Dam and Reservoir, constructed in the channel of the river 210 miles upstream from Whalen, Wyoming where the diversion works are located. The reservoir has a capacity of 1,045,000 acre feet of water. It was completed in February, 1913. An auxiliary channel reservoir named the Guernsey, with a capacity of 50,870 acre feet, is located immediately above Whalen. It was completed in July, 1927. It is used both for storage and for regulation. Two small inland reservoirs are located in Nebraska known as Lake Alice and Minatare, having a capacity of 11,400 and 67,000 acre feet respectively. Minatare, the last to be constructed, was completed in June, 1914.

The two main supply canals—Interstate and Ft. Laramie—take out from the river at the Whalen diversion dam, 42 miles above the Nebraska state line. The Interstate is

[1]Act of June 17, 1902, 32 Stats. 388.

[2]For an abridged history of the project see N-564. For a map showing the various physical features, see U. S.-3. Copies of the various applications for permits approved by the Wyoming State Engineer appear as U. S.-10 to 19, 23 to 27, and 38, summary with acreages U. S.-50, costs U. S.-57 and 72, summary of work U. S.-73.

on the north side and the Ft. Laramie on the south side of the river. They both extend from Whalen through eastern Wyoming far into western Nebraska. A third canal—the Northport—is located wholly in Nebraska. It forms an extension of a private Nebraska canal called the Tri-State, which carries the Northport water to the point of commencement of that canal. These main canals are provided with the usual systems of laterals and ditches, which carry water to the lands to be irrigated. The canals and laterals of the project are estimated to have a total length of over 1,600 miles. As an adjunct to the irrigation works and for the avoidance of water logging of the land an extensive drainage system was also constructed.

The two hydroelectric power plants are located one at Lingle and the other at Guernsey, Wyoming. The Guernsey plant, which was the final unit of the project, was completed in January, 1928.

The total cost of the project was approximately $19,000,000. Its magnitude may be judged from the facts, first, that it was designed to serve 237,000 acres of land not previously irrigated, whereas the total irrigation in the entire North Platte basin, when the project was initiated, covered less than 500,000 acres,[1] and, second, that the storage capacity of the Pathfinder Reservoir is 1,045,000 acre feet, as compared with an average total run-off of the river at the location of the reservoir of but 1,315,900 acre feet.[2] In other words, the capacity of the reservoir is 79 per cent of the average annual run-off.

As contemplated by the Reclamation Act, the United States undertook to recoup the cost of the North Platte

[1] C-118.
[2] Average for 37 years 1904-1940.

Project as well as the expense of its operation and maintenance from the land owners served. The original contracts providing for these payments were in the form of Water Right Applications.[1] Eventually these contracts were assumed by the irrigation districts, municipal corporations organized by the land owners as authorized by the laws of Wyoming and Nebraska.[2]

The effects of the project were several:

One. It greatly increased the water resources of the river available for irrigation. The reservoirs captured and impounded large quantities of flood flows and out-of-season discharges which formerly had run off unused and wasted so far as irrigation is concerned. Surplus waters are held over from one season to another. The stored water is released in the critical middle and late summer seasons when the shortage of natural flow water is most acute and the crops face the greatest hazard from drought. Nor are the benefits of the storage water limited to the land to which it is directly applied. Only a portion of water used for irrigation is thereby consumed. Water remaining after evaporation and transpiration first saturates the subsoil, forming ground storage. When that process is completed and the water tables have risen to the necessary levels, all additional water applied in excess of consumption returns to the stream either in the form of visible surface flows or invisible ground percolation. This return flow water becomes available for rediversion and irrigation use. The development of return flows in Nebraska following the completion and operation of the North Platte Project is graphically shown on Nebraska's Exhibit 411, from which it appears that in the section between its western border and Bridgeport, a distance

[1]Example: U. S. 44-47.
[2]Example: N-570; R. 14980-81.

of sixty miles, the annual visible return flows rose from a negligible quantity in 1911 to approximately 700,000 acre feet in 1927, an increase attributable in the main to the direct and indirect influence of the North Platte Project and the application of project storage water to lands in eastern Wyoming and western Nebraska.[1] These return flows are in the nature of a "windfall" to irrigators who are so situated on the river as to be able to avail themselves of their use, particularly those who are themselves without storage rights and who therefore have to carry no burden of storage costs.

Two. The operation of the North Platte Project has greatly complicated the problem of water administration in Wyoming and Nebraska. Water impounded in Wyoming must be allocated between that State and Nebraska. Releases and deliveries must be correspondingly adjusted. Storage water must be segregated from the natural flow. The quantity of each must be determined as at the Whalen diversion dam, more than 200 miles below the point of storage release. All storage plant and diversion works are in Wyoming, beyond any physical control by Nebraska. For satisfaction of their rights the Nebraska appropriators must not only invoke Wyoming law but also are dependent upon Wyoming officials for actual distribution. There is the anomaly of an interstate project without interstate administration.

Three. The scope to be given the principle of priority of

[1]For 1930-1940 net return flows Whalen, Wyoming to North Platte, Nebraska, see W-148. The return flows naturally fell off during the dry period beginning with 1931, and particularly from 1934. Nevertheless, in the years 1931 to 1936 the May-September net return flows available for diversion after deduction of channel evaporation loss were as follows: Whalen-Nebraska State Line Section, 54,300 acre feet; State Line to Bridgeport, 311,000 acre feet; Bridgeport to North Platte (including some sand hill percolation) 44,800 acre feet. See N-412-415.

appropriation becomes a question of increased importance. The Pathfinder Reservoir, as well as the natural flow appropriation of the project, has a priority of December 6, 1904. The Pathfinder priority extends to the full capacity of that reservoir of 1,045,000 acre feet. Until the reservoir fills in any given year, no junior appropriator in Wyoming above the reservoir may under the priority rule divert water which would otherwise reach the reservoir. While in practice the greater part of the storage water is accumulated outside of the regular irrigation season, yet the right to store according to priority extends throughout the year. The Colorado border lies only 180 miles above Pathfinder. Are the North Park appropriators junior to Pathfinder likewise to be regulated for the benefit of that reservoir (regardless of state line), which would mean for the benefit of lower Wyoming and Nebraska appropriators who are entitled to North Platte Project storage water?

A similar question arises with respect to the Guernsey Reservoir, but that is of less importance because of the smaller capacity and later priority of that reservoir.

Warren Act Contracts.

The Warren Act contracts take their name from the Act of Congress of February 21, 1911 (36 Stat. 925) known as the "Warren Act". That Act authorizes the Secretary of the Interior to contract for the storage and delivery of any surplus water conserved by any reclamation project over and above the requirements of the project proper. In connection with the North Platte Project nine such contracts were entered into by the United States, three with Wyoming

and six with Nebraska districts.[1] The total quantity of water thus contracted for was approximately 307,000 acre feet per season. The largest contract and the one most in controversy is that with the Farmers Irrigation District of Nebraska (Tri-State Canal), which provides for 180,000 acre feet per season. These contracts further extend the use and benefits of Pathfinder and Guernsey storage water.

Kendrick Project.

A second large Federal reclamation project in Wyoming is known as the "Kendrick Project".[2] Its primary purpose is the irrigation of 66,000 acres of land in Natrona County lying northerly and westerly of Casper. It also includes a large hydro-electric power plant. The first unit, capable of serving 35,000 acres, was completed in 1940, but has not been put into operation because of lack of water supply. The canals and laterals of the second unit are under construction. The storage facilities which are completed consist of two channel reservoirs—the Seminoe, with a capacity of 1,026,400 acre feet, and the Alcova, with a capacity of 190,500 acre feet. The Seminoe is thirty miles above and the Alcova thirteen miles below Pathfinder. The power plant is located at the Seminoe. The total cost of the project is estimated at $19,350,000, corresponding closely with the cost of the North Platte Project. This cost, according to plan, will be liquidated out of power revenues and payments by the land own-

[1]The names of the districts are the Hill, Lingle, and Rock Ranch Districts in Wyoming, and the Farmers, Gering, Central, Chimney Rock, Browns Creek, and Beerline Districts in Nebraska. For the Wyoming contracts, see W-19-25, 29, and for Nebraska see N-530-536. These contracts and their proper construction are the subject of rather serious controversy, which will be considered later. See part II, page 189.

[2]For general testimony concerning Kendrick, see R. 15268-15342, 15435-6; description of project, W-1; map, W-2; repayment contract, W-3; approved applications for permits, U. S.-22, 28 to 33, and 35.

ers under contracts similar to those made with the North Platte Project appropriators.

The combined storage capacity of the reservoirs of the Kendrick and North Platte Projects is 2,313,270 acre feet. This is equal to 175 per cent of the long-time average annual river run-off at the location of the Pathfinder Reservoir.

Sutherland and Tri-County Projects.

These are Nebraska projects. The Sutherland is a combined irrigation and power development. The Sutherland reservoir is located off-channel 53 miles above North Platte. It has a capacity of 175,000 acre feet. The entire project was completed in 1935.

The Tri-County Project (Central Nebraska Power and Irrigation District) is also a combined hydroelectric power and irrigation project. It has a channel reservoir (the Kingsley) about 55 miles above North Platte and about eight miles north of the town of Ogalalla. Its capacity is 2,000,000 acre feet, nearly twice that of the Pathfinder or the Seminoe in Wyoming. It is expected to conserve a water supply sufficient to bring under irrigation 205,000 additional acres within the counties of Phelps, Kearney, and Adams. The project was in the main completed in 1941 at a total cost of approximately $37,000,000.

The Sutherland and Tri-County Projects were each financed by the Federal Government, partly in the form of loans and partly by outright grants.[1]

With the completion of the Sutherland and Tri-County Projects and irrigation of the additional lands in contemplation, the acreages under irrigation in the three States

[1]Testimony concerning the financing of the Tri-County Project will be found on pages 25883-86 of the Record.

from the North Platte and Platte Rivers will be approximately as follows:[1]

Colorado	131,800 acres	(12%)
Wyoming	325,720 "	(29)%
Nebraska	653,355 "	(59%)
Total	1,110,875	(100%)

BACKGROUND AND ORIENTATION.

The North Platte River has long been the subject of potential controversy between the three litigating States. This has been due to the central fact that the dependable natural flow of the river during the irrigation season has long been over-appropriated.[2] So far as this river is concerned, neither Wyoming nor Colorado has ever recognized any extension of priorities across state lines, nor have they ever limited or regulated diversions by their appropriators in subordination to or for the benefit of senior appropriators of a lower State. They have in effect taken the position, with some reason perhaps, that for the water officials of either State to undertake, in the absence of compact, interstate agreement, or decree, to make an equitable apportionment between their own State and other States, and accordingly to limit their own appropriators in favor of others, would involve a responsibility they could not well be expected to assume. Furthermore, on Colorado no demand for regulation had been made by Nebraska or Wyo-

[1] Arrived at by supplementing the 1939 figures appearing in the tabulation on page 29 by adding to the Nebraska acreage 65,000 acres representing irrigation between North Platte and Kearney and 205,000 acres for Tri-County Project. Wyoming figure does not include any part of the 60,000 acres expected to be irrigated under the Kendrick Project.

[2] R. 21427, 24878.

ming prior to the commencement of this suit, and on Wyoming demands were made by Nebraska only as shortly to be mentioned.

All efforts of the States to settle their differences by compact appear to have failed.[1]

Prior to the construction of the Pathfinder Reservoir and operation of the North Platte Project, there was a serious shortage of water for irrigation in Nebraska east of Bridgeport. This fact, together with the rather frequent occurrence of periods of local precipitation sufficient to permit successful agriculture without irrigation, led to the abandonment[2] of many irrigation enterprises which had been initiated in the 80's and 90's. This was particularly true of the section east of the city of North Platte.[3] After the return flows from the North Platte Project were well developed,[4] the water supply for Nebraska was so greatly improved that most of the abandoned projects were revived. From then until 1931 the supply was reasonably adequate for most of the Nebraska canals, and had the conditions of that period continued it may well be doubted that the present litigation would ever have arisen. This is indicated by

[1]While there is little direct evidence as to negotiations for a compact, it was clearly disclosed by discussions of counsel that much time and effort had been devoted to a possible compromise settlement without avail; that one of the great obstacles to the success of such effort had always been the existence of conflicting interests, and therefore of antagonistic groups within each of the States, and the difficulty of agreement upon any compact which would win legislative approval in each of the States. Colorado in her cross-bill alleges the failure of its efforts to reach agreement on the terms of a compact. See Subdivision Seventeenth, page 46, of her Answer and Cross-Bill. Wyoming admits that efforts by the three States to arrive at a basis of division of the waters of the river had failed. See Subdivision Seventeenth, page 20, of her answer to the Cross-Bill of Colorado.

[2]The word "abandonment" is not used here as necessarily signifying a forfeiture or loss of appropriative right. Some abandonments occurred even in eastern Wyoming. U. S. 112B, p. 43.

[3]U. S.-83; R. 20183, 20217, et seq., 20467-72; U. S.-112A, pp. 10, 15, 49, 50; U. S.-112B, pp. 75-80; R. 2171-2211, 8760-65, 26617-19, 26594.

[4]From about 1914. R. 2185.

the fact, among others, that the first demands of a definite nature by Nebraska on Wyoming were, according to the evidence, made in 1931,[1] being particularly pressed in 1933.[2] There is an indefinite reference to some demands which may have been as early as 1921,[3] but they are not much relied upon.

There is no demonstration in the evidence that under long-time average conditions, implemented by the storage reservoirs now in use, there would be any serious shortage of water for irrigation in Nebraska or Wyoming east of Whalen. The contrary is indicated, at least if proper distribution of the water available be assumed or provided for. Nebraska in fact does not rest her case upon any claim or showing of shortage prior to 1930, but primarily upon evidence of shortage and of misappropriation of water by the upper States since 1930 and of threats of still more serious shortages and misappropriation in the future.

The year 1931 ushered in the driest "cycle" (if that be the proper designation) in the North Platte and Platte River valleys of which there is any record.[4] This is plainly observable from the graph on page 25. The mean of the river flow for the thirty-seven year period 1904 to 1940 is commonly used in the evidence as a long-time average or norm. By comparison with that mean (taking the flow at Pathfinder as an index), the flow for each of the years 1931 to 1940 was as follows:[5]

1931	55 per cent	1936	81 per cent
1932	116 per cent	1937	87 per cent
1933	89 per cent	1938	103 per cent
1934	30 per cent	1939	54 per cent
1935	54 per cent	1940	44 per cent

[1]N-137-167. [2]R. 623-644. [3]R. 630.
[4]The word "swing" was preferred to "cycle" by a climatologist. (R. 27077-9).
[5]Run-off figures at Pathfinder used in computation of percentages are first corrected to present conditions of irrigation development.

The average river flow for the ten years 1931 to 1940 fell to 71 per cent of the long-time 1904-1940 average,[1] to 63 per cent of the 1904-1930 average, and to 61 per cent of the 1921-1930 average.[2] In each of five years in the ten-year period 1931-1940, the flow was lower than in the lowest preceding year of record. The previous low was in 1919. The flow of that year compared with that of 1931, 1934, 1935, 1939, and 1940 was as follows:[3]

1919	859,700 acre feet
1931	706,300 acre feet
1934	382,200 acre feet
1935	696,200 acre feet
1939	698,200 acre feet
1940	569,800 acre feet

Since 1930 only one year has equalled the mean of the 1904 to 1930 period. Previous periods of extreme drought were of comparatively short duration—one year, or at most two or three years. The present cycle has persisted for 13 years, with no evidence yet that the end is approaching. What the length of this cycle portends for the future is a matter on which no expert has ventured an opinion.[4]

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[1]Corrected to present condition of irrigation development.
[2]Uncorrected.
[3]Engineers Stipulation, p. 11. The irrigation development above Pathfinder since 1919 was so limited as not to materially distort the flow for the purpose of comparison with the years following.
[4]An interesting study was presented by Nebraska through Nels A. Bengston, Professor of Geography of the University of Nebraska, based upon certain articles by J. B. Kincer, a distinguished meteorologist and climatologist, and published by the United States Weather Bureau. One of these articles was captioned "Is Our Climate Changing?" The study disclosed a world-wide trend towards higher temperatures for more than 50 years past. This was connected with the subject of water supply by the testimony of Professor Bengston that in general higher temperatures are attended with lower rainfalls and higher water requirements. However, neither Mr. Kincer nor Professor Bengston presumed to make any forecast as to whether the trend shown would continue indefinitely or as to when a reversal might be expected. See N-649, 650, and 651. R. 27034-27081.

It is manifest that this dry cycle was one of two factors mainly responsible for precipitating this litigation. The other was the initiation of the Kendrick Project in Wyoming, which Nebraska conceived to carry a threat of large additional depletion of the river flow otherwise available to users below Alcova.

The dry cycle having now persisted since 1931 with no sign of abatement, is it still to be regarded as temporary or is it now to be accepted as a new normal unless and until the trend is reversed? The answer to this question may have an important bearing on the disposition of this case. It will be further discussed at a later point. Suffice it to say here that this cycle has been attended with severe water shortages, and, if it is to be regarded as more than a passing phenomenon, has an important bearing upon the issues in the case.

The length of the river, its physical features, the extremity of variation in conditions, and other factors require that the basin be broken down into the sections previously mentioned for the purpose of study and for considering the necessity for and method of equitable apportionment. No uniform principle or rule of apportionment could be devised that would be possible of application to the whole river. As already observed, the problem centers particularly in two areas: First, the section Seminoe to Alcova, the site of the great Government storage reservoirs, and, second, the short so-called "Whalen—Tri-State Dam" section, with its enormous diversion draught on both natural flow and storage water. The latter section has such a large bearing on the general problem as to require thorough analysis before consideration of apportionment in relation to the other sections.

The facts will therefore be first reviewed as to each section, beginning at the head of the basin in Colorado and extending down river to and including the "Tri-County" project in Nebraska. Following this, discussion of equitable apportionment in the several sections will be taken up in the same order.

DETAILED ANALYSIS OF IRRIGATION AND WATER PRODUCTION AND CONSUMPTION IN THE SEVERAL SECTIONS OF THE RIVER BASIN.

Colorado.

The drainage area of the North Platte River and its tributaries (exclusive of the Laramie River) in Colorado lies entirely in the region known as North Park and has an extent of approximately 1650 square miles, a large proportion (53%) of which consists of national forest reserves and public lands. Only 35 per cent is under private ownership.[1] The altitude ranges from about 8,000 to 10,000 feet above sea level. *Most of the irrigated lands* are under the 8,500 feet level.[2] The climate is arid. The average annual precipitation in the central portion is about 10 inches, increasing gradually in the higher altitudes.[3] The precipitation is mainly in the form of winter snows, little coming in the growing season. For example, at Spicer, where the annual precipitation is 11.31 inches, that of the growing season is only 2.35 inches.[4] With this degree of aridity it is self-evident that irrigation is indispensable to crop production.

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[1] C-7.
[2] C-41, 72, 73; R. 22942-3.
[3] C-3, 80.
[4] C-84, 85.

Low temperatures prevail. At Spicer the average annual is 36.9 degrees Fahrenheit and the average for the growing season is 61 degrees.[1] The growing ("frost-free") season is only about 60 days.[2]

The sole industry is cattle raising. It is dependent on native hay and pasturage, the only crops of the region, which in turn are dependent upon irrigation.[3] The land devoted to hay raising averaged annually during the ten-year period 1929 to 1938, 88,182 acres. The average value of the cattle marketed annually during the same period is estimated at $645,000.00, and the average number of sheep on range, according to tax assessment returns, was 39,000.[4] The population of Jackson County is 1,386 and of Walden, the largest town in the county, is 284.[5]

Irrigation began about the year 1880.[6] Thereafter there was a steady and relatively rapid expansion for about 30 years. By 1910 the land under irrigation had risen to 113,500 acres. The rate of increase then fell off, and by 1920 development had practically come to a standstill. The *following 20 years added but 2,670 acres. Present irriga*tion is represented by 131,800 acres.[7]

Irrigation practices in North Park are influenced by the shortness of the growing season and of the period of available water supply, by ground surface conditions and other factors. The irrigation season is roughly from the middle of May to the middle of July.[8] During the short season of plentiful water, large applications are made to the land. Consequently, despite the shortness of the irrigation season the quantity of water applied is relatively large and the

[1] C-77, pp. 1, 86, 87.
[2] C-82, pp. 2, 83; R. 22684, 23561.
[3] R. 22944.
[4] C-57.
[5] 1930 Census; R. 22943-4.
[6] R. 22344.
[7] C-117, 118; R. 22075-22104.
[8] R. 22684, 22827, 22972-74.

diversion rates are correspondingly high. The seasonal average is about 4½ acre feet per acre.[1] From the standpoint of river depletion, the more important factor is the "consumptive use" rate. The lands irrigated for the most part lie close to the streams and return flows develop rapidly and are very large in relation to diversions. As a result, the consumptive use rate average is but 0.74 acre foot per acre. This means that of the diversion of 4.5 acre feet per acre, 3.76 acre feet returns to the stream. Applying this consumptive use rate to the 131,800 acres under irrigation gives a total annual water depletion by irrigation in North Park of 97,500 acre feet. To this should be added an estimated 1,040 acre feet to cover annual reservoir evaporation loss.

Also to be taken into account are certain transmountain diversions being made from the tributaries of the North Platte to the basin of the Cache La Poudre, a tributary of the South Platte River. These diversions have averaged about 4,000 acre feet per annum in the past and are expected to average at least 6,000 acre feet per annum in the future.[2] Thus, the total depletion from irrigation and reservoir evaporation losses and from exportations becomes 104,540 acre feet per year.

As a result of a study by the Colorado Conservation Board, it was determined that in addition to the 131,800 acres now under irrigation another 30,390 acres are "irrigable" from constructed ditch systems having decreed water rights. Still other lands are classified as "arable", being land of a quality generally suitable for irrigation and

[1] C-54.
[2] C-43, 44, 56, 127; R. 22148.

physically accessible to sources of water supply. How much of these additional lands could be supplied within the limits of adjudicated rights or of present canal facilities of available water sources was not determined.[1] Only by construction of additional storage facilities could any considerable water be supplied to such lands, and it was estimated that with full development of all possible storage facilities not more than 34,400 acres of additional land could be brought under irrigation. This would place a total limit on irrigation in North Park, present and future, of 166,000 acres.[2]

The additional 30,390 acres of "irrigable" land mentioned are included in projects of the Walden Ditch & Reservoir Company, Jackson County Land & Irrigation Company, and a few other small undeveloped projects,—Sand Creek and Mendenhall Ditch, Canadian Highline Ditch, Indian Ditch, Monahan Ditch, Little Grizzly Area, and the Roaring Fork Area. The record indicates that the completion and utilization of these projects is nothing more than a possibility of the indefinite future. The Walden Project, which is the largest, never progressed beyond the survey stage back in 1915. It has been abandoned by its original sponsors and nothing in the evidence indicates when, if ever, it will be revived. While on the Jackson County Project there were 25 miles of construction on the ditch and lateral system, and some irrigation was at one time carried on, there has been no construction since 1911. The promoting company has dissolved and no movement is presently under way or in prospect for completion or further use. All of these projects are junior to Pathfinder.[3]

[1] C-37, 38; R. 22104-6, 22890-6.
[2] R. 22428, 22867-8, 22992, 24514.
[3] C-58-59, 62, 68; R. 22879-85, 22412-24, 22758, 22936-7.

Transmountain diversions from the basin of the North Platte to the basin of the Cache La Poudre, tributary of the South Platte, are from the Michigan River and its tributaries through the Cameron Pass and Michigan Ditches. The Cameron Pass Ditch has two priorities, one of July 30, 1882, and the other of July 8, 1898. The Michigan Ditch has a priority of July 10, 1902, and an extension priority of July, 1904. During the twenty-seven year period, 1913 to 1939, inclusive, the average annual diversion of the two ditches was a total of 4,069 acre feet. Conveyance losses in these diversions are large and maintenance is high. The water is delivered into the Jo Wright Creek, a tributary of the Cache La Poudre, and then into Chambers Lake, a reservoir, from where it flows down the Cache La Poudre River and is diverted for use upon land in the general vicinity of Fort Collins and Greeley in Larimer and Weld Counties.[1]

The procedure for perfecting water rights in Colorado has been explained. The total number of final decreed rights in North Park is 758, aggregating approximately 6,875 second feet. The average area of land under each right is about 180 acres, and the average flow of water under each is about nine second feet. The number of ditches having decreed rights is 463, which means that the number of second feet allotted to each ditch is on the average 14.8, and that the average number of acres served by each is 296. Only three final ditch decrees exceed 100 second feet.

Of the decreed rights, in terms of second feet, 59 per cent carry priorities of 1899 or earlier, 23.6 per cent fall into the decade of 1900-1909, 13.6 per cent in the decade 1910-1919, and 1.4 per cent in the period 1920-1939. Of

[1] C-35, sheet 10, 42, 43, 44; R. 2212-74, 22899-22914.

the total of 6,875 second feet, 4,619 second feet, or 67.3 per cent, have priorities senior to 1905 and 2,256 second feet, or 32.7 per cent, carry priorities of 1905 or later.[1] Assuming rights represented by the junior 2,256 second feet to be fully exercised at the rate of one second foot for 20 acres, there would be irrigated under these rights 45,000 acres with a consumptive use (at the 0.74 rate) of 33,300 acre feet per annum. This would be the maximum consumptive use under rights junior to the North Platte Project. Probably not all of these rights are fully exercised. At the rate of one second foot to 20 acres, 6,871 second feet would supply 137,500 acres as compared with 131,800 acres actually irrigated. This indicates that 5,700 acres, or about four per cent, of right acreage is not actually irrigated; also it indicates that the decreed rights are within this small margin of exhaustion.

No regulation or limitation has ever been imposed upon water users in North Park for the benefit of Wyoming or Nebraska or their appropriators.

Wyoming.

Colorado-Wyoming State Line to Pathfinder Reservoir.

This section of the river has a length of 180 miles. Conditions affecting irrigation are similar to those of North Park, Colorado. There is the same aridity of climate, the annual precipitation average varying at different points from 10 to 12 inches and seasonal precipitation from 8 to 4¼ inches. Elevation tends downward, varying from

[1] C-35, N-367 brought up to 1939; the significance of the year 1905 is that the priority of the North Platte Project, including Pathfinder Reservoir, is December 6, 1904, giving it seniority over all appropriations of 1905 or later.

7,320 feet at Encampment to 5,735 at Pathfinder Dam. The mean annual temperature ranges from 41 to 45½ degrees and mean seasonal from 61 to 64½ degrees. The frost-free period or growing season is considerably longer than in North Park, running from 96 to 129 days. The irrigation season averages from 60 to 75 days, the heaviest irrigation being practiced between May 15 and June 25.[1]

The basic industry, as in North Park, is livestock, in aid of which the land is devoted to hay and pasturage, for which irrigation is indispensable. There is substantial production of alfalfa and minor yields of such grains as oats and barley.[2]

Adjudicated water rights cover approximately 272,000 acres. About 149,400 are actually irrigated. Most of the irrigation is from Tributary streams, irrigation on the main river being limited to about 9,400 acres while the tributaries supply about 140,000 acres. The appropriations from the main stream aggregate 166.5 second feet, covering 11,679 acres, as compared with 3,719 second feet from tributaries, covering 260,321 acres. Of the total acreage carrying adjudicated water rights approximately 162,000 acres, or 56 per cent of the whole, have rights with priorities senior to December 6, 1904, while 110,000 acres, or 44 per cent, have rights junior to that date. In terms of second feet, this division would be 3,885 and 1,501 respectively.[3] Of the main river canals rights aggregating 166.85

[1] See Table I, p. 27.

[2] Testimony as to the Livestock industry, products of the land, and necessity of irrigation relates to individual ranches and is interspersed through the record. The necessity of irrigation is not questioned and the testimony on that subject does not require analysis. There was testimony that land without water supply was worth not more than $1.25 to $2.50 per acre, while that under irrigation had a value of $35 to $50 per acre. Testimony as to the cattle industry and crop production may be found on the following pages of the record: 16995, 16999-17001, 17081, 17114, 17146, 17193, 17229-30, 17289, 17339, 17400, 17446, 17491, 17496, 17524, 17545, 17558, 17580, 17591-2, 17608, 17642, 17656, 17692, 17706-7, 17731-2, 17805, 17834, 17842, 17853, 17858, 17899, 17902, 17921, 18043, and 18045.

[3] N-93 and 368; W-47.

second feet, 147.26, or 88 per cent, are senior to December 6, 1904. What the division is on the tributaries does not appear. The total acreage irrigated (149,000 acres) is less than the total senior acreage (162,000 acres). It is reasonable to suppose that a larger percentage is irrigated of the senior than of the junior acreage; also that a relatively greater volume of water is consumed on the senior irrigated acreage because of the earlier closing of the juniors. It probably could be conservatively estimated that at least 65 per cent of the consumption is under the senior rights.[1]

There is no record of measured headgate diversions. Wyoming concedes that a rate of three acre feet per acre is adequate. Land consumptive use is about one acre foot per acre.[2] At this rate the total consumption by rights junior to December 6, 1904 (35 per cent of 149,400 acres) would be 52,290 acre feet annually.

There are a large number of small reservoirs ranging in size from less than 100 acre feet to 3,200 acre feet. Their total capacity is about 18,000 acre feet. They do not fill every year, and there is no hold-over of water from year to year of any consequence. The extent of reservoir evaporation losses is not shown, but must be rather negligible.[3]

Tributary accretions to the river in this section are very large. As previously stated, the average annual water production in the area for the 1895-1939 period was 1,059,240 acre feet, netting the river, after transportation losses, 939,640 feet.[4] If the present irrigation land consumption of 149,400 acre feet be deducted, the final net contribution to the river becomes 790,240 acre feet. Thus, the land consumption is 14 per cent of the gross and 16 per cent

[1] W-81.
[2] W-99; N-46, 76; C-119, 129; R. 19681, 20971.
[3] R. 27254-6.
[4] C-129.

of the net productions. The consumption by rights junior to Pathfinder on the ratio assumed before would be 5.6 per cent of the net production.

There is no present prospect of any large expansion of irrigation in this section. Five additional projects have been under consideration, some of which are partially constructed. They are:

(1) The Saratoga Project. The original application for this project called for a priority of November 16, 1921. The application has never been acted on, and no construction work has ever been done. Plans for financing the project have never been consummated.[1]

(2) The Sierra Madre Project. Permits covering 11,160 acres (reduced by a change of plan to 8,700 acres) with a priority of December 6, 1910, have been issued. Eight miles of canal was constructed, but in 1930 work was discontinued and no irrigation has ever been attempted. Time for completion under the original permits expired December 31, 1939. Whether it has been extended does not appear.[2]

(3) The Medicine Bow Project. This has an assigned priority of June 23, 1910, for 14,357 acres. There has been practically no construction since 1901.[3]

(4) The Red Lake Project. For this a permit was issued with a priority of February 22, 1918, covering 10,918 acres. There has been some construction, but no work has been done on the proposed main ditch, and there has been no irrigation. The maximum anticipated development is 1700 acres.[4]

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[1] W-62, 63, 64; R. 18745-18819.
[2] W-66; R. 18920-53.
[3] W-66; R. 18820-66.
[4] W-77; R. 19222-41.

(5) The Rock Creek Project. This is the only one of the five projects that is in actual operation. About 7,000 acres are under irrigation, being included in the total of 149,400 acres estimated for the section. Wyoming suggests a possible further development to the extent of 3,000 acres. Although permits for the various features of the project were issued between 1905 and 1912, there has been no construction since 1919 and there is no evidence of any present intention or plan to extend the project further. For all that appears, it may have reached its limit.[1]

Pathfinder Reservoir to Whalen.

The length of this section is 210 miles. The physical and climatic trends observed in passing from North Park to Pathfinder continue. The Ft. Laramie station, located a few miles below Whalen, may be taken as representing the east end of the section. There the elevation is 4,715 feet; the mean annual and seasonal temperatures are 47 degrees and 66 degrees respectively; and the mean annual precipitation is 14.8 inches and the mean seasonal 7.6 inches. The frost-free period averages 125 days.[2]

The total land irrigated lies somewhere between 55,000 and 61,000 acres.[3] About 14,000 acres are supplied from the main stream. Diverting from the main river are 60 canals representing 97 priorities ranging from December 26, 1887, to August 9, 1937. The irrigation projects on the river are mostly those of individual farmers and are very small, averaging not over 160 acres. If the Douglas Canal, with its 3,423 acres, be taken out of the average, the remaining canals

[1] W-54; R. 18453-18548.
[2] C-71, 72, 80-87.
[3] Neb. says 55,000 acres (1926-1935 period), N-87; U. S. Census 1929 shows 58,280 acres, C-107; Colo. estimates 61,200 acres, C-118.

would average but 121 acres. A diversion rate of 2.5 acre feet per acre per season is adequate.[1] During the 1930-1940 period diversions averaged only two acre feet per season.[2] The consumptive use rate is about 1.1 acre feet per acre, varying somewhat according to the diversion rate.[3] At the 2.5 rate, the total seasonal headgate diversion of the 14,000 acres supplied from the main stream would be 35,000 acre feet, of which about 16,000 acre feet would be consumed and 18,200 acre feet returned to the river. About 85 per cent, or 15,470 acre feet, of the return would occur during the irrigation season, leaving 2,730 acre feet of post-season return. The total irrigation season loss to the river, therefore, incident to irrigation would average about 19,530 acre feet.[4]

Approximately 48 per cent of the rights on the river in this section in terms of acreage are junior to the North Platte Project. Thus of the total water loss to the river during the irrigation season, 9,374 acre feet would be due to the use of water by these junior rights.

On the tributary streams the run-offs are of shorter duration even than those above Pathfinder. The flows reach their peak in May, fall off rapidly during June, and usually run dry by the first of July, before there is serious shortage of water in the river.[5] There are hundreds of small diversions on these tributaries,[6] regulation of which could be of little, if any, benefit to the river below.

While the tributary inflow in this section is small in comparison with the sections above, yet it does exceed the river depletion due to irrigation and other stream losses.

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[1]R. 26467, 27397, 27652-5.
[2]W-152; R. 26467.
[3]C-119; R. 26388-9.
[4]R. 26391-2, 27818.
[5]C-97; R. 371.
[6]N-93 lists 4,654 Wyoming rights on the North Platte River exclusive of the Laramie River and Horse Creek. R. 19434-5.

The average annual net gain in the section during the fifteen-year period 1926-1940 was 83,600 acre feet, and during the ten-year period 1931-1940 was 64,200 acre feet.[1]

Stock raising is the major industry. Alfalfa is the principal irrigated crop, but there is also substantial production of sugar beets, potatoes, and grains.

Whalen to Tri-State Dam.

From Whalen, Wyoming, to the Nebraska state line is 42 miles. The lower terminus of the so-called "Whalen-Tri-State Dam" section is the diversion dam of the Tri-State Canal, located about a mile below or east of the state line. Within this mile are the headgates of three large Nebraska Canals—the Tri-State, the Gering, and the Northport.[2] Just above the state line is the headgate of the Mitchell Canal, serving Nebraska land and now controlled by the Nebraska Irrigation Administration.[3] Another small Nebraska canal —the Ramshorn—receives its supply through the Tri-State. These five canals are commonly referred to as the "State Line Canals". They are dependent for supply solely on water crossing the state line. As generally used herein, the term "State Line Canals" excludes the Northport, which is a North Platte Project canal.

This is the pivotal section of the entire river. Here is focused the main problem of water distribution. In this short 43-mile span there is concentrated a demand for water as great as in the entire preceding 415 miles (omitting the Kendrick Project not yet in operation) from the interior of North Park to Whalen. The irrigated lands supplied

[1]U. S.-271, Colo. 34.
[2]Water for the Northport is diverted through the Tri-State headgate and carried by that canal to the Northport District.
[3]State ex rel. Sorensen v. Mitchell Irrigation District, 129 Neb. 586, 262 N. W. 543.

with water diverted in the section, as determined in this report, total 326,000 acres as compared with 339,200 acres in the entire upper valley—main river and tributaries. The consumptive use on this 326,000 acres far exceeds that of the three upper sections combined.

Heading in this section are canals of three classes: (1) North Platte Project canals; (2) private canals having Warren Act contracts for storage supplies, and (3) private canals having no storage rights. From the section is distributed all of the storage water of the North Platte Project, and most of that covered by the Warren Act contracts.

It is with respect to this section that the sharpest controversy exists between the parties regarding the facts, the law to be applied, and the proper basis of apportionment. For these reasons and because of the magnitude of the projects involved, it is necessary to make a detailed study of the individual canals, the land served by them, and the water supplies available for distribution. While a decree in a water suit between States cannot, generally speaking, deal with individual appropriations or projects, yet in such a situation as that here presented the equitable shares of the States cannot well be arrived at except through an analysis of the requirements, priorities, and equities of the individual canals as well as the water supplies available for the lands served by them.

The North Platte Project canals are three in number: The Ft. Laramie, the Interstate, and the Northport. The first two take out from the river at the Whalen Diversion Dam, serve certain areas in Wyoming, then cross the state line and supply large irrigation districts in Nebraska. The Northport is wholly in Nebraska and is physically an extension of the Tri-State Canal. The latter, under contract with

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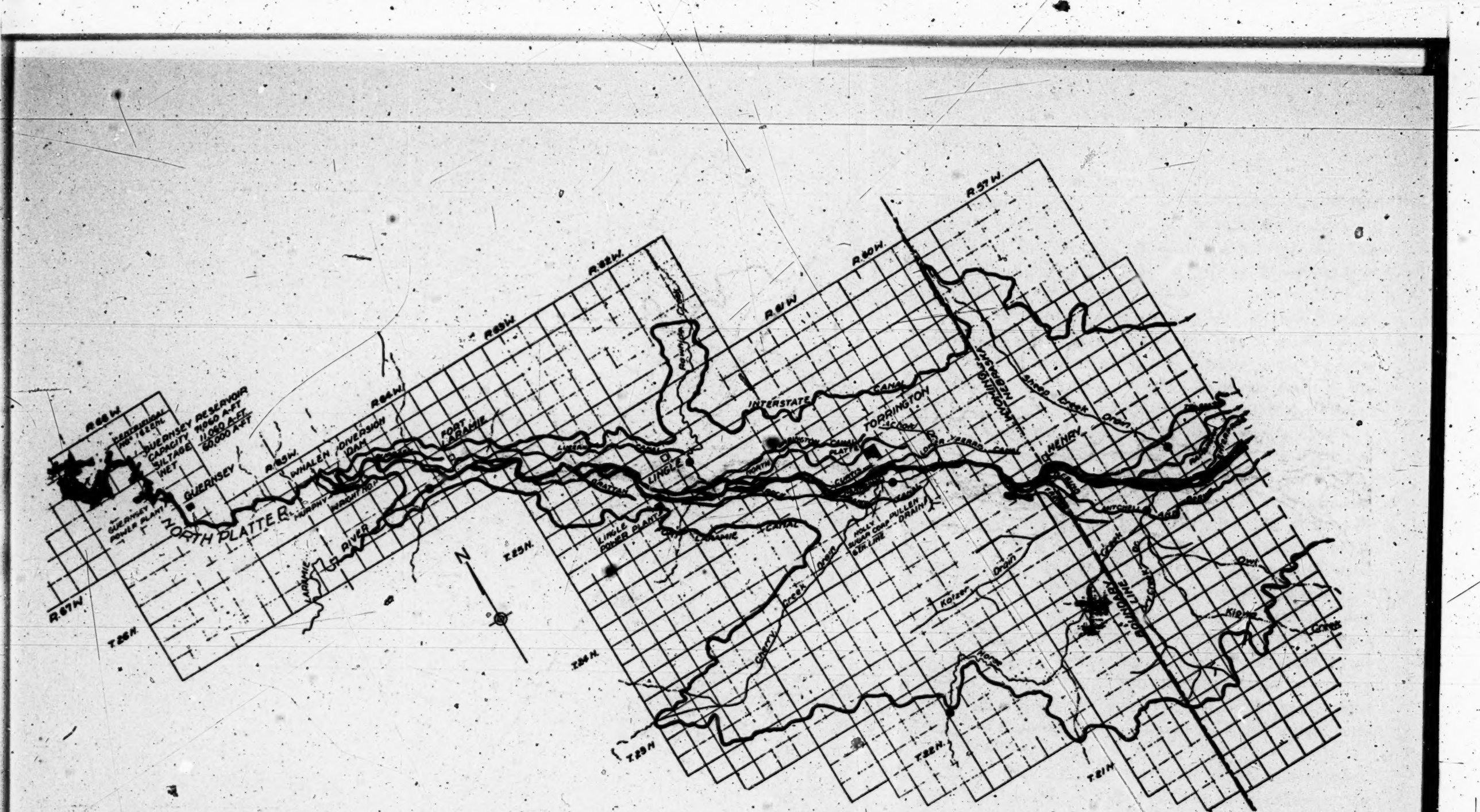
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T.26N.
T.25N.
T.24N.
T.23N.
T.22N.
T.21N.
TERRITORIAL INTERVAL
GUERNSEY RESERVOIR
CAPACITY 11,060 A-FT
SILTAGE 50,000 A-FT
NET
GUERNSEY POWER PLANT
GUERNSEY
NORTH PLATTE R.
WHALEN DIVERSION DAM
FORT LARAMIE
LINGLE
LINGLE POWER PLANT
TORRINGTON
INTERSTATE CANAL
NEBRASKA-WYOMING
HENRY
MORRILL
MITCHELL
SCOTTSBLUFF
GERING
HOLLY SUGAR CORP. STR. LINE
MULLEN DRAIN
LARAMIE R.
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the United States, carries the Northport water from the Tri-State headgate a distance of 80 miles to the so-called Red Willow Rating Flume, where it is delivered to the Northport district. The lands under each of these three canals have natural flow appropriations with a priority of December 6, 1904, and also have contracts with the United States for shares of the water stored in the project reservoirs.

Two Wyoming districts are supplied through the Interstate Canal, although not included in the North Platte Project. They are the Hill Irrigation District and the Lingle Water Users Association. Each has a Warren Act contract. In addition there are nine Wyoming private canals diverting below Whalen, one of which (Rock Ranch) has a Warren Act contract. One, called the French Canal, crosses the state line and serves lands in both States.

On the page opposite appears a map showing the course of the river from Guernsey Reservoir to a point about nine miles below the Wyoming-Nebraska state line, and within the same limits, the North Platte Project Canals, the Nebraska State Line Canals, and various of the Wyoming private canals. This map is a section of Nebraska's Exhibit 110. For an extension of this map eastward into Nebraska, see Nebraska's Exhibits 97, 98, and 99. For a map showing in greater detail the river and the North Platte Project Canals and lands from Whalen, Wyoming to the termini of the canals in Nebraska, see United States Exhibit 3. This map also shows various other canals, tributary streams, and the like.

The evidence as to the canals in this section runs to great length, relating to areas irrigated, water requirements, canal losses, and similar matters. Pertaining to the Tri-State Canal alone there are over 800 pages of oral testimony on

the question of the acreage actually irrigated and on which the water requirement of the canal should be based.

A detailed review of the important portions of this evidence appears later in Part II, beginning on page 196, under the caption "Evidence Concerning the Whalen-Tri-State Dam Section". What follows will summarize my conclusion as to requirements of the section, priorities, water supplies, diversions, deliveries, and the nature and extent of deficiencies and surpluses. In table II will be shown the requirements of the lands under each canal in terms of (1) acreages irrigated, (2) headgate diversion rate in acre feet per acre per year necessary to deliver an adequate supply to the lands, and (3) the total acre feet per annum so required.

The term "acreage irrigated" needs to be clarified. Much of the testimony relates to what may be referred to as the "right" acreage, that is, acreage having an existing water right. As used in this report, "acreage irrigated" refers only to such "right" acreage as is currently demanding and using water. The maximum limit would be the greatest acreage irrigated in any one year, assuming a water supply sufficient to permit full irrigation. There was testimony with reference to large projects that about 93 per cent of the project acreage might be expected to be under irrigation each year.[1] The acreages found to be under irrigation in the area now under consideration vary rather widely in many cases from those upon the basis of which deliveries were made by the water officials of the States. In Nebraska, for example, delivery schedules were generally based on acreage reports made by the land owners containing estimates of the land "intended to be irrigated" in the season following. Often these estimates bore little relation to the land actually irrigated.

[1] R. 28621-2.

TABLE II

REQUIREMENTS OF CANALS DIVERTING IN WHALEN-TRI-STATE DAM SECTION

Name of Canal	Acres Irrigated	Acre Feet Per Acre	Total Acre Feet Per Annum
Ft. Laramie:			
Goshen Irrigation District, Wyoming	50,000	2.75	137,500
Wright and Murphy Lands, Wyoming	210	2.75	577
Gering-Ft. Laramie District, Nebraska	53,500	2.75	147,100
Interstate:			
Lingle and Hill Districts, Wyoming	13,800	3.33	46,000
Pathfinder District, Nebraska and Wyoming	98,000	4.28	419,000
Nine Wyoming Private Canals	16,103[1]	2.67	43,000
French, Nebraska Land	1,025	2.67	2,737
Mitchell	13,633	2.57	35,000
Gering	13,500	2.67	36,000
Northport	13,000	4.2	54,600[2]
Tri-State	52,300	3.5	148,000[2]
Ramshorn	2994	3.0	3,000
Total	326,065		1,072,514

[1]Includes 651 acres of Wyoming land under French Canal.

[2]The full Tri-State requirement for 52,300 acres at 3.5 acre feet per acre is 183,050 acre feet, but this canal has in the past intercepted and utilized certain flows below the Tri-State Dam, which averaged yearly during the 1931-1940 period 35,500 acre feet (W-149). Deducting this from 183,050 leaves 147,750 (called 148,000) shown above as the Tri-State requirement on water from Wyoming. These interceptions will presumably in the future go to the Northport Irrigation District under the decision of United States v. Tilley, 124 F. (2d) 850. They are charged here against Tri-State to correspond with some requirement and historical supply tables to follow. Later in priority and apportionment studies they will be charged to the Northport.

The annual requirement found to be imposed on the Whalen-Tri-State Dam section is 1,072,514 acre feet. This should be reduced to irrigation season requirement, since the sufficiency or insufficiency of supply is determined primarily by comparison of seasonal demands and requirements. The irrigation season in this area is considered to be of five months duration—May to September, inclusive. During the months of October, November, and April, the Interstate Canal diverts at Whalen and transports to the inland reservoirs in Nebraska—Lake Alice and Minatare—variable quantities of water which are released in the following irrigation season for use on the lands of the Pathfinder Irrigation District. Such storage water reduces the irrigation season demand of the canal on the river at Whalen. The average October, November, and April diversions of the Interstate for this purpose during the years 1928 to 1939, inclusive, was 36,700 acre feet.[1] Included in this average are three abnormally low years, 1934, 1935, and 1939, when the diversions were respectively 17,000, 0, and 15,900 acre feet. Although these were low water years, the aggregate October-November-April flows at Whalen were 33,500, 21,220, and 36,300 acre feet respectively.[2] It seems unlikely that there will need to be a recurrence of diversions as low as in these three years. Excluding them, the average for the remaining years between 1928 and 1939, inclusive, would be 46,000 acre feet. Wyoming and Colorado urge that the Interstate Canal be charged with capacity use of Lake Alice and Minatare reservoirs, which is 73,000 acre feet. The United States suggests 65,000 acre feet. Nebraska contends for 36,700 acre feet. While all of the water di-

[1]N-630.
[2]Engineers Stipulation, p. 13.

verted to these reservoirs is for use on Nebraska lands, the diversions are under the physical control of Wyoming or the United States. If greater utilization of the reservoir in 1928 to 1939 was due to faulty operation, the responsibility for such operation is not fixed by the evidence. Icing of the canal may have been a factor. My conclusion is that 46,000 acre feet should be adopted as the charge against the Interstate seasonal requirement for water storable in Lake Alice and Minatare.[3] This deducted from the total Interstate requirement of 419,000 acre feet leaves a net seasonal requirement of that canal at Whalen of 373,000 acre feet, and reduces the total net seasonal requirement of all canals diverting in the Whalen-Tri-State Dam section to 1,027,000 acre feet.

Water Supply for Whalen-Tri-State Dam Section.

The water supply available to this section must be determined as accurately as possible for two purposes: first, to learn whether it is sufficient or insufficient to meet the requirements; second, to determine what volume of water there is for apportionment if it is to be apportioned. It is argued that there is no real shortage of water, and therefore no need of apportionment. Support for this argument is drawn particularly from the long-time mean or average supply, but sufficiency is claimed even for the supplies of the present dry cycle. In this connection it is contended by Wyoming that in interstate apportionment natural flow and storage water should be pooled and treated as a common fund.

[3]Should it be found in the future that a dependable winter supply of more than 46,000 acre feet is divertable to Alice and Minatare, the seasonal demand on the river of Interstate should be accordingly reduced.

Nebraska's case, as previously said, rests primarily on the 1931-1940 decade and the shortages and violation of her priorities within that period. Evidence relating to prior years is generally in character and not directed to the proof of any specific wrong or injury to her which of itself would require equitable relief. Even were the issues not thus narrowed, it would be a question whether the period since 1930 would not be the one according to which equitable distribution should primarily be considered. It goes without saying that mere temporary fluctuations or short swings are not controling, but the experience of the last thirteen years raises the question as to how long a lower level of water supply must persist before it becomes normal or is to be so considered. That question will receive some further attention later under "Problems Presented by the Dry Cycle" (p. 119). In the present connection the supply data will be examined both as to the long-term and as to the drouth period.

In the case, as here, of a widely fluctuating flow, there is always the problem of determining what is the true supply. It is generally declared to be only that which can be regarded as "dependable". In *Wyoming v. Colorado* (259 U. S. 419, 483-4) it was said that the average flow of all years could not be taken as a measure of what is available for practical use, nor would the lowest flow of the years furnish the test; that there was a dependable flow materially in excess of the lowest. That which was adopted as the dependable flow was substantially under the average.

LONG-TIME MEAN.

Several studies were introduced of the long-time records of supply for this section. They are presented in the following exhibits covering the periods designated:

Nebraska, Exhibits 8 and 46, for the years 1901 to 1935;
Wyoming, Exhibit 170, for the years 1904 to 1940;
Colorado, Exhibit 168, for the years 1895 to 1939.

Nebraska's Exhibit 46 shows that the average annual flow at Whalen for the 35-year period 1901 to 1935 was 1,611,259 acre feet, and under present conditions of irrigation development would have been 1,570,000 acre feet. The May-September average was 1,306,000 acre feet, and under present conditions of development would have been 1,265,500 acre feet.[1] If to this be added the usable Whalen State Line accretions hereinafter shown to have been 86,450 acre feet during the years 1931 to 1940, inclusive,[2] the total seasonal supply becomes 1,352,000 acre feet.

Wyoming's Exhibit 170 shows the average annual flow at Guernsey for the years 1904 to 1940, inclusive, to have been 1,562,000 acre feet, and under present conditions of irrigation development 1,525,000 acre feet, indicating a depletion correction of 37,000 acre feet. If the total present condition annual flow be apportioned between May-September and October-April on the basis of Nebraska's Exhibit 8 (i.e. 81 per cent and 19 per cent), the May-September average would be 1,235,250 acre feet. Deducting from this the depletion correction of 37,000 acre feet, the

[1]The depletion correction averaging 40,500 acre feet a year is on account of additional land consumptive use above Whalen and additional evaporation loss in the Pathfinder and Guernsey Reservoirs. It is almost entirely May-September depletion, and for the purpose of these calculations is charged entirely to the May-September period.

[2]Over the long term these accretions were undoubtedly very considerably larger than during the 1931-1940 period.

remainder is 1,198,250. Adding 86,450 acre feet for Whalen State Line accretions gives a final total of 1,284,700 acre feet.

Colorado's Exhibit 168, on the basis of 1895-1939 average supplies and present consumption, finds an annual outflow at Whalen of 1,540,900 acre feet. By reference to Colorado's Exhibit 92, it is found that the actual mean outflow above Whalen for the same period of years was 1,603,100 acre feet, or 60,200 above the present condition figure. The latter apparently represents depletion correction. Apportioning the actual flow on the basis of Colorado's Exhibit 92 (80 per cent and 20 per cent), the May-September actual flow average would be 1,282,480 acre feet. Deducting from this the depletion of 60,200 acre feet, the remainder is 1,222,280, which increased by the State Line usable accretions of 86,450 acre feet gives finally 1,308,730 acre feet.

The average seasonal supply for the Whalen—Tri-State Dam section, according to these studies, compares with the requirement as heretofore found, in terms of acre feet, as follows:

Nebraska study (1901-1935) 1,352,000; requirement 1,027,000; seasonal excess 325,000.

Wyoming study (1904-1940) 1,321,700; requirement 1,027,000; seasonal excess 294,700.

Colorado study (1895-1939) 1,308,700; requirement 1,027,000; seasonal excess 281,700.

On the face of these figures it appears that the long-time mean seasonal supplies were well above the seasonal requirement of this section. However, the following points of caution should be called to attention: (1) These are *mean,* but not necessarily *dependable,* supplies; (2) they

combine natural flow and storage water; (3) they include unusable supplies passing Whalen; (4) satisfaction of requirement presupposes distribution of the supplies in accordance with requirements; (5) a sufficient supply on a *seasonal* basis does not preclude serious shortages at particular times during the season.

In her Exhibits 170 to 176, Wyoming presented a study to show what would have been the result had the Kendrick Project with its reservoirs been in operation during the 37 years 1904 to 1940 under present conditions as to requirements, but with additional depletion above pathfinder of 68,500 acre feet. The study starts with assumed empty reservoirs on October 1, 1903. It is made to appear that the seasonal requirements of all canals down to and including the Nebraska state line canals could have been satisfied with a final residue of storage on September 30, 1940, of 169,300 acre feet. This study, however, assumes a Whalen-Tri-State Dam seasonal requirement of 950,000 acre feet as compared with the requirement of 1,027,000 acre feet found in this report. This gives rise to an annual difference of 76,200 acre feet, which over the 37-year period would total 2,819,400 acre feet. Presumably a minor portion of this could have been satisfied out of water that otherwise appears as reservoir "spills".

United States' Exhibits 267 to 273, particularly 271 and 273, present the result of a day-to-day study of supply and requirements from the Seminoe Reservoir in Wyoming to the Kingsley Reservoir in Nebraska, on the assumptions (a) that the Kendrick Project with its reservoirs had been placed in operation at the beginning of the water year 1926 (October 1, 1925); (b) that all of the reservoirs of the Kendrick and North Platte Projects had been subsequently

operated jointly without reference to priority, and (c) that natural flow and storage water had been administered as a common fund.[1] It was found that the drouth period would have been entered with all reservoirs filled to capacity (April, 1930), and that thereafter all of the Whalen-Tri-State Dam Diversion requirements could have been fully satisfied until August, 1940. Shortage for the Kendrick Project first appeared in September, 1939, and some minor shortages below the state line appeared as early as July, 1931.[2] This study adopts a seasonal requirement for the North Platte Project and State Line Canals that is 59,000 acre feet per season above that found in this report. However, it assumes winter diversions for the Interstate Canal of 73,000 acre feet per year as against a finding of 46,000 acre feet.

With respect to both the Wyoming and United States studies it might be observed that they represent operations on paper which permit a degree of perfection not achievable in practical administration. They presuppose a completely controlled distribution, so that every appropriation, when water is available, will receive its proper requirement, no more, no less. Nevertheless they do point to the conclusion that under a long-term operation involving use of the Seminoe and Alcova Reservoirs as well as the Pathfinder and the pooling of natural flow and storage water, accompanied by strict regulation of distribution, the needs of the Kendrick Project and of the Whalen-Tri-State Dam section could have been reasonably supplied up to and in-

[1] U. S.-271 assumes irrigation of the first unit of the Kendrick lands—35,000 acres, and U. S.-271 assumes irrigation of all lands in the project, aggregating 66,000 acres.
[2] R. 28742-6.

cluding most of the year 1940. The same would be true of any similar hypothetical operation commencing long enough prior to 1930 to permit accumulation of storage water to the capacity of the reservoirs before the onset of the dry cycle.

THE 1931-1940 PERIOD.

The usable supply for this period can be determined with approximate accuracy. The extent of the land irrigated and requirements were practically constant. There were no reservoir "spills", and the flow at Whalen represented substantially the true usable supply at that point during the period. The following tabulation shows the seasonal supply from all sources, including natural flow and storage water, compares such supply with seasonal requirements as heretofore determined, and gives the resulting excesses and deficiencies:

TABLE III

ANALYSIS, REQUIREMENT, AND SUPPLY 1931-1940 WHALEN - TRI-STATE DAM SECTION

Year	Supply Above Whalen[1]	Laramie River Inflow[2]	Whalen State Line Usable Net Accretions[3]	Total Supply	Requirement	Excess or Deficiency
1931	1,074,600	16,700	49,000	1,140,300	1,027,000	113,300
1932	1,315,000	19,300	45,200	1,379,500	1,027,000	352,500
1933	1,379,000	35,700	77,400	1,492,100	1,027,000	465,100
1934	452,900	2,700	56,000	511,600	1,027,000	—515,400
1935	771,300	48,800	49,900	870,000	1,027,000	—157,000
1936	963,880	17,300	51,300	1,032,480	1,027,000	5,480
1937	1,153,750	37,800	60,800	1,252,350	1,027,000	225,350
1938	1,040,550	33,800	95,800	1,170,150	1,027,000	143,150
1939	994,150	9,300	89,600	1,093,050	1,027,000	66,050
1940	576,820	10,900	57,200	644,920	1,027,000	—382,080
Average	972,195	23,230	63,220	1,058,645	1,027,000	31,645

[1]Engineers Stipulation, p. 13.
[2]W-173.
[3]Total net sectional accretions from W-148, from which are deducted unusable accretions in the section from U. S.-271, Column 48.

From the foregoing it appears that in seven of the ten years included in the tabulation the seasonal supply for the section exceeded the requirement and in three the requirement largely exceeded the supply. If in the years for which large excesses are shown the canal diversions were limited to the requirements as herein determined, the result would have been that large unused flows would have passed the Tri-State Dam. In fact the flows passing Tri-State Dam during the seasons in question were far below the indicated excesses. For example, in 1932 and 1933, the years of largest flows in the period, when the seasonal excesses were 352,500 and 465,100 acre feet respectively, the seasonal flows passing Tri-State Dam were 145,900 and 285,500 acre feet.[1] The difference is due to the fact that the canal diversions in the section were largely in excess of the specified requirements. This tends to emphasize again that apparent sufficiency of supply is actual only if properly regulated and diversions are held to reasonable requirements. If the diversions during the period had been held to the determined requirements, and if the excess water above those requirements had been held in storage in the upper reservoirs and released indiscriminately to all canals as needed, irrespective of storage rights, then any surplus water otherwise passing Tri-State Dam would have been conserved and a different result obtained. Under such method of operation it would appear that the total supply would have closely approached sufficiency for the section. This leaves out of account any supply for the Kendrick Project.

[1] C-180.

STORAGE WATER SEGREGATION.

The North Platte Project storage water was disposed of under contracts between the United States and the land owners under the project and the Warren Act contract purchasers. The rights of the latter are subordinate to the rights of the project appropriators, and are limited to such water as may be stored in excess of what is necessary to satisfy the project contracts. The obligation and necessity of performance of these contracts must be recognized by the decree. The only water subject to allocation therefore is the natural flow. In such allocation, however, the storage water available may bear upon the equities of the States, although it would have no bearing upon the legal rights of individual appropriators as between each other under the law of either Wyoming or Nebraska.

The segregation or separate accounting of natural flow and storage water is a problem of considerable difficulty, and has been a subject of disagreement between the parties. When storage water is released from Pathfinder or Guernsey Reservoir, it immediately intermingles with the natural flow of the river and loses its identity. Segregation at any point below involves not only determination of the quantity at point of release but also the travel time factor and the transportation losses, including evaporation and bank and channel percolation and storage. A formula has been evolved, as shown on United States Exhibit 204a, upon which Nebraska and the United States are now agreed, but to which Wyoming does not agree. This is the formula currently in use, and I think must be employed unless and until the engineers of the parties can devise and agree upon some other.

Nebraska submitted a segregation analysis of the outflow from Guernsey for the years 1931 to 1936, inclusive.[1] The loss formula employed was that in use prior to the adoption of United States Exhibit 204a. Its accuracy is disputed, and it is admittedly subject to a material margin of error. Nevertheless, the results of the analysis give at least a useful approximation of a proper segregation. In the following table IV it has been carried down to and including 1940 by use of estimates based on the Nebraska exhibits. For each of the years 1937, 1938, 1939, and 1940 a division is made of the water at Guernsey by applying in each year the proportions appearing in the Nebraska study for the most nearly comparable year. Usable net accretions between Guernsey and the state line are added to the natural flow found to have passed Guernsey to make up the total sectional natural flow fund. This fund is then set up against the total requirement, all with the following results, expressed in acre feet except the figures in the percentage column.

[1] N-226, 261, 306, 417, 419, and 421.

TABLE IV
ANALYSIS REQUIREMENT AND NATURAL FLOW WATER SUPPLY, 1931-1940
WHALEN - TRI-STATE DAM SECTION

Year	Total Above Whalen	Storage %	Storage	Natural Flow	Usable Increment Whalen to State Line	Total Natural Flow	Requirement	Deficiency of Natural Flow
1931	1,074,600	62	666,252	408,348	65,700	474,048	1,027,000	552,952
1932	1,315,000	50	657,500	657,500	64,500	722,000	1,027,000	305,000
1933	1,379,000	52	717,080	661,920	113,100	775,020	1,027,000	251,980
1934	452,900	72	326,088	126,812	58,700	185,512	1,027,000	841,488
1935	771,300	66	509,058	262,242	98,700	360,942	1,027,000	666,058
1936	963,880	52	501,217	462,663	68,600	531,263	1,027,000	495,737
1937	1,153,750	62(a)	715,325	438,425	98,600	537,025	1,027,000	489,975
1938	1,040,550	62(a)	645,141	395,409	129,600	525,009	1,027,000	501,991
1939	994,150	52(b)	516,958	477,192	98,900	576,092	1,027,000	450,908
1940	576,820	64(c)	369,164	207,656	68,100	275,756	1,027,000	751,244
Average						496,267	1,027,000	530,733

(a) Most comparable year 1931.
(b) Most comparable year 1936.
(c) Mean between 1934 and 1935.

According to the foregoing computations, the average seasonal supply of natural flow water available in the section for the period was but 18 per cent of the total requirement and in the year of largest flow (1933) was but 75 per cent. This means that if during the periods of deficiency the storage right canals enjoying early priorities received natural flow water on a priority basis, drawing on their storage water merely as a supplemental supply or holding it in reserve against later needs, the canals of later priority without storage rights would have suffered extreme shortages. That this practice would have the sanction of legal right as between individual appropriators can hardly be disputed. That in general it has been the practice according to which natural flow and storage water have been administered in times of inadequate supply (since 1930) also appears.[1] In view of the inferiority of position of the lands dependent solely on natural flow, it becomes pertinent to inquire how extensive such lands are as compared with lands having also storage rights. In the following table lands supplied from the section are separated into two classes, those with and those without storage rights, and for each district are shown the acreage included and seasonal requirements. Lands having storage rights under Warren Act contracts are indicated by asterisks; all other storage right lands are of the North Platte Project.

[1]For example, Tri-State. R. 10766-77.

TABLE V

WHALEN - TRI-STATE DAM SECTION

LANDS HAVING STORAGE RIGHTS

WYOMING

District	Acreage	Seasonal Requirement Acre Feet
Goshen District (Ft. Laramie Canal)	50,000	137,500
Lingle and Hill Districts* (Interstate Canal)	13,800	46,000
Rock Ranch District* (Rock Ranch Canal)	954	2,550
Total Wyoming	64,754	186,050

NEBRASKA

District	Acreage	Seasonal Requirement Acre Feet
Gering-Ft. Laramie District (Ft. Laramie Canal)	53,500	147,100
Pathfinder District (Interstate Canal)	98,000	419,000
Gering District* (Gering Canal)	13,500	36,000
Farmers District* (Tri-State Canal)	52,300	148,000
Northport District (Tri-State and Northport Canals)	13,000	54,600
Total Nebraska	230,300	804,700

*Warren Act Contract.

Total Wyoming and Nebraska	295,054	990,750
Total Wyoming-Nebraska North Platte Project	201,500	703,600
Total Wyoming-Nebraska Warren Act Contracts	93,554	287,150

TABLE VI

WHALEN-TRI-STATE DAM SECTION

LANDS WITHOUT STORAGE RIGHTS

WYOMING

District	Acreage	Seasonal Requirement Acre Feet
Nine Private Canals (17,128 minus 954 acres, Rock Ranch Canal having Warren Act Contract and minus Nebraska land under French Canal)	15,149	40,450
Wright and Murphy Lands (Ft. Laramie Canal)	210	577
Total Wyoming	15,359	41,027

NEBRASKA

District	Acreage	Seasonal Requirement Acre Feet
Mitchell District (Mitchell Canal)	13,633	35,000
Ramshorn District (Ramshorn Canal)	994	3,000
Lands under French Canal	1,025	2,737
Total Nebraska	15,652	40,737

Total Wyoming and Nebraska without storage rights	31,011	81,764
Total Wyoming and Nebraska with storage rights	295,054	990,750
Totals, final	326,065	1,072,514

The lands having both natural flow and storage rights constitute 90 per cent of the total; of this 90 per cent, 68 per cent are project lands and 32 per cent have Warren Act contracts; of the lands having storage rights, 78 per cent are in Nebraska and 22 per cent are in Wyoming; of the lands having natural flow rights only, 49 per cent are in Nebraska and 51 per cent are in Wyoming.

To see clearly how water administration in the section has worked out in practice, it is necessary to compare the diversions with the requirement of each canal and to compare one canal with another. That is done as to the years 1931 to 1940 in Tables VII to XIV following, in which are shown the quantities of water diverted seasonally and annually by each canal in the section, the excess or deficiency of seasonal diversions as compared with the requirements, and percentage of the requirement represented by the diversions. The nine Wyoming private canals are grouped as one. In a later table (XV) the general averages for the period of all canals in the section are set up in form for ready comparison of each one with the others. The sources of data used in the compilations are Wyoming's Exhibits 87 to 94, 144, 145, 146, 160a, 160b, and United States Exhibit 266. In still another series of table (XX to XXVI, in Part II, page 247 to 253) is shown the monthly distribution in mean second feet for the same period in comparison with the statutory maximum for the acreages found.

DIVERSIONS AND REQUIREMENTS OF INDIVIDUAL CANALS FOR THE YEARS 1931-1940, WHALEN - TRI-STATE DAM SECTION

TABLE VII

INTERSTATE CANAL

Year	Diversions*	Requirement*	Excess or Deficiency*	Percentage of Requirement
1931	488,600	465,000	23,600	105
1932	592,600	465,000	127,600	127
1933	555,800	465,000	90,800	120
1934	197,300	465,000	—267,700	42
1935	317,900	465,000	—147,100	68
1936	404,100	465,000	—60,900	87
1937	494,200	465,000	29,200	106
1938	490,000	465,000	25,000	105
1939	418,800	465,000	—46,200	90
1940	209,200	465,000	—255,800	45
Average	416,850	465,000	—48,150	90

*Includes Lingle and Hill and Winter diversions to Alice and Minatare Reservoirs.

TABLE VIII

FT. LARAMIE CANAL

Year	Diversions,	Requirement	Excess or Deficiency	Percentage of Requirement
1931	263,300	285,177	—21,877	92
1932	314,000	285,177	28,823	110
1933	298,500	285,177	13,323	104
1934	125,000	285,177	—160,177	44
1935	185,000	285,177	—100,177	65
1936	228,000	285,177	—57,177	80
1937	281,000	285,177	—4,177	98.5
1938	276,700	285,177	—8,477	97
1939	275,400	285,177	—9,777	96.5
1940	138,100	285,177	—147,077	48
Average	238,500	285,177	—46,677	84

TABLE IX

NINE WYOMING PRIVATE CANALS

Year	Diversions*	Requirement**	Excess or Deficiency	Percentage of Requirement
1931	45,020	45,737	—717	98
1932	50,197	45,737	4,460	109
1933	48,738	45,737	3,001	106.5
1934	51,600	45,737	5,863	113
1935	48,719	45,737	2,982	107
1936	65,726	45,737	19,989	144
1937	60,012	45,737	14,275	131
1938	55,250***	45,737	9,513	121
1939	70,200	45,737	24,463	153.5
1940	63,100	45,737	17,363	138
Average	55,860	45,737	10,120	122

*Net after wastes.
**Includes Nebraska land under French Canal.
***Annual for 1938 was 59,412.

TABLE X

MITCHELL CANAL

Year	Diversions May-Sept.	Diversions Annual	Requirement	Excess or Deficiency	Percentage of Requirement
1931	46,210	46,210	35,000	11,210	132
1932	44,920	46,870	35,000	9,920	128
1933	45,430	47,329	35,000	10,430	130
1934	33,860	37,022	35,000	—1,140	97
1935	21,148	34,651	35,000	—13,852	60
1936	30,529	51,975	35,000	—4,471	87
1937	40,870	48,583	35,000	5,870	117
1938	34,622	39,002	35,000	—378	99
1939	30,800	32,500	35,000	—4,200	88
1940	16,100	27,100	35,000	—18,900	46
Average	34,450	41,120	35,000	—550	98

TABLE XI

GERING CANAL

Year	Diversions May-Sept.	Diversions Annual	Requirement	Excess or Deficiency	Percentage of Requirement
1931	37,946	37,946	36,000	1,946	105
1932	43,517	43,517	36,000	7,517	121
1933	45,248	47,318	36,000	9,248	126
1934	9,869	12,338	36,000	—26,131	27
1935	11,070	26,146	36,000	—24,930	31
1936	25,192	46,524	36,000	—10,808	70
1937	35,740	49,321	36,000	—260	99
1938	26,179	29,916	36,000	—9,821	73
1939	30,650	31,540	36,000	—5,350	85
1940	15,160	26,810	36,000	—20,840	42
Average	28,060	35,140	36,000	—7,943	78

TABLE XII

TRI-STATE CANAL

Year	Diversions* May-Sept.	Diversions* Annual	Requirement	Excess or Deficiency	Percentage of Requirement
1931	245,804	245,804	183,000	62,804	134
1932	264,774	268,516	183,000	81,774	145
1933	215,747	215,747	183,000	32,747	118
1934	119,629	119,629	183,000	—63,371	65
1935	176,892	206,180	183,000	—6,108	97
1936	233,183	246,657	183,000	50,183	127
1937	216,533	223,818	183,000	33,533	118
1938	182,180	183,015	183,000	—820	100
1939	207,160	211,150	183,000	24,160	113
1940	167,160	177,820	183,000	—15,840	91
Average	202,900	209,830	183,000	19,900	111

*Diversions include diversions at Tri-State Dam plus interceptions below.

TABLE XIII

RAMSHORN CANAL

Year	Diversions May-Sept.	Diversions Annual	Requirement	Excess or Deficiency	Percentage of Requirement
1931	4,080	4,080	3,000	1,080	136
1932	4,494	4,494	3,000	1,494	150
1933	4,279	4,279	3,000	1,279	143
1934	469	469	3,000	—2,531	16
1935	1,948	1,948	3,000	—1,052	65
1936	2,041	2,200	3,000	—959	68
1937	2,887	2,887	3,000	—113	96
1938	2,666	2,666	3,000	—334	89
1939	2,800	3,100	3,000	—200	93
1940	1,120	1,120	3,000	—1,880	37
Average	2,680	2,720	3,000	—320	89

TABLE XIV

NORTHPORT CANAL

Year	Diversions May-Sept.	Diversions Annual	Requirement	Excess or Deficiency	Percentage of Requirement
1931	43,788	43,788	54,600	—10,812	80
1932	49,705	50,359	54,600	—4,895	91
1933	77,416	77,416	54,600	22,816	141
1934	28,078	28,078	54,600	—26,522	51
1935	38,367	38,367	54,600	—16,233	70
1936	46,660	46,660	54,600	—7,940	85
1937	62,632	62,632	54,600	8,032	114
1938	48,375	48,752	54,600	—6,225	89
1939	57,430	57,950	54,600	2,830	105
1940	24,500	24,500	54,600	—30,100	45
Average	47,690	47,850	54,600	—6,910	87

A ten-year summary of the foregoing data is given in the following table. Column (1) gives the average percentage for the ten years (1931-1940) of requirements supplied by the May-September diversions: Column (2) gives the same average, but with the effect of excessive diversions in all seasons eliminated; that is, the diversion in any season appearing to be in excess of requirement is taken at 100 per cent of requirement only. Columns (3) and (4) are the same as columns (1) and (2), excepting that annual instead of seasonal diversions are used for the percentage computations. The canals are arranged in the order of their standing in column (2). The percentages in that column are probably the truest index of the adequacy of the supply, since neither water received in the May-September period in excess of requirement nor that received in the October to April months has a value comparable to the May-September water within the actual needs of the lands.

TABLE XV.

COMPARISON WITH REQUIREMENTS OF TEN-YEAR AVERAGE DIVERSIONS OF CANALS IN THE WHALEN-TRI-STATE DAM SECTION, EXPRESSED IN PERCENTAGES, 1931-1940 PERIOD.

Canal	(1) Percentage of Requirement May-September Diversions	(2) Percentage of Requirement May-September Diversions, Excesses Excluded	(3) Percentage of Requirement Annual Diversions	(4) Percentage of Requirement Annual Diversions, Excesses Excluded
1. Nine Wyoming Private Canals	122	99.8	122	99.8
2. Tri-State	111	94	114	98
3. Mitchell	98	88	117	107
4. Interstate	90	83	90	83
5. Ft. Laramie	84	82	84	82
6. Northport	87	81	88	81
7. Ramshorn	89	76	91	78
8. Gering	78	73	98	92

From this analysis it appears that the average seasonal diversions by the canals in this section for the ten-year period have supplied from 78 to 122 per cent of the determined seasonal requirements of the canals. Eliminate the seasonal excesses from the average and the percentages are 73 to 99.8. The seasonal diversions of the nine Wyoming private canals have consistently been largely in excess of their seasonal requirements. This has been possible because of their ability to utilize the accretions between Whalen and the Nebraska state line. The Tri-State Canal on the average fared well because of its seniority (being the third oldest Nebraska priority on the river) and because of its Warren Act contract. The Mitchell, while

under Wyoming control and up to 1935, was well supplied except for 1935, when its supply was reduced to 60 per cent of requirement. Even in the lowest year of all—1934—it enjoyed a 90 per cent supply. Since control passed to Nebraska in 1936 to and including 1940, the average percentage has been 87 per cent of requirement or with elimination of the 1937 excess 84 per cent. The canal suffering the greatest shortage was the Gering, with an average including excesses, of 78 per cent, and excluding excesses 73 per cent. This notwithstanding its Warren Act contract. The water for the Gering District is transported through the Mitchell Canal, with opportunity for error in distribution between the two districts. There was some suggestion in the evidence that this was a factor.[1] There was also mention of some benefit to the Gering District from seepage from the Ft. Laramie Canal and from the operation of pumps.[2]

Monthly Distribution of Supply

Adequacy of supply depends not only on seasonal quantities but also on the distribution of these quantities through the season. Large diversions in early season when water is plentiful may result in an average that is deceptive as respects adequacy of supply for crop production. While distribution of requirement varies considerably with the kind of crops raised, weather conditions, and other factors, an approximation of an ideal monthly schedule for this section would be one delivering 11 per cent in May, 24 per cent in June, 26 per cent in July, 24 per cent in August, and 15 per cent in September.[3] How this compares with actual experience may be seen from the following tabulation, which gives in percentages of total seasonal

[1] R. 11190, 11264.
[2] R. 3610.
[3] W-159; R. 26479, 27439, 27703.

diversions the average for the ten years of each of the irrigation season months, and compares these percentages with those representing the theoretical "ideal" distribution. The canal percentages are computed from monthly diversion data found in the Nebraska Biennial Reports.[1]

TABLE XVI

COMUARISON OF ACTUAL WITH "IDEAL" DISTRIBUTION BY MONTHS OF TOTAL SEASONAL DIVERSIONS

	May	June	July	August	September
"Ideal"	11	24	26	24	15
Tri-State	13	24	26	21	16
Mitchell	18	24	25	20	13
Ramshorn	18	27	27	20	8
Gering	21	24	24	21	10
Interstate	17	21	25	26	11
Ft. Laramie....	11	18	28	29	14
Northport	9	24	27	26	14

These figures indicate a closer correspondence between actual and "ideal" monthly distribution than might have been expected.

A final step in the analysis of distribution involves study of the variations which occur during each month. This is dealing in pretty narrow refinements in relation to the broad issue of interstate distribution, but if the subject is to be pursued to its ultimate these variations are not unimportant. Monthly fluctuations are often very wide as before noted. The inflow to the Pathfinder Reservoir best illustrates the characteristic behavior of the river when free from distortion by the presence of storage water. For the years 1909 to 1935, inclusive, Nebraska's Exhibit 6 gives the inflows to Pathfinder as they occurred daily, in second feet. The maximum and minimum for each month of the irrigation season during the years 1931 to 1935 were:

[1]Reports of Department of Roads and Irrigation.

	May	June	July	August	September
1931					
Maximum	3730	4900	2380	1080	805
Minimum	1380	500	95	185	160
1932					
Maximum	12060	8660	6960	1420	530
Minimum	3060	6070	1070	280	50
1933					
Maximum	6460	11510	2760	870	1460
Minimum	1960	2620	490	75	100
1934					
Maximum	2070	1050	640	320	149
Minimum	640	160	30	5	73
1935					
Maximum	5087	9918	2909	885	365
Minimum	408	3058	402	101	112

These fluctuations of flow are reflected in canal diversions, particularly of those dependent on natural flow. The Mitchell Canal affords an illustration. For the years 1934 and 1938 (the first being the year of lowest flow of record and the second being above normal), the mean, the maximum, and the minimum of the Mitchell diversions for each irrigation season month were:

	May	June	July	August	September
1934					
Mean	127	152	81	104	95
Maximum	180	200	110	135	100
Minimum	67	96	0	90	90
1938					
Mean	33	128	177	123	110
Maximum	150	189	199	196	191
Minimum	2	50	153	2	53

While it is possible that during 1938 the fluctuations in diversion were affected by factors other than supply, it is probably safe to assume that at least during June, July, August, and September of 1934 the canal was continuously diverting substantially all the water available.

Priorities in Whalen-Tri-State Dam Section

Consideration of requirements in relation to supply in the section leads to the matter of priorities, and particularly the relationship between the priorities of Wyoming and those of Nebraska. In respect to priority rank, the canals in the section fall into thirteen groups, seven in Wyoming and six in Nebraska. The earliest priority group consists of four Wyoming canals, the next in order are two Nebraska canals, followed by three in Wyoming, and so on. In the following table all canals in the section are arranged in order of priority and the State for each group indicated. Opposite each canal are set forth its priority date, the acreage irrigated, the maximum number of second feet under the statutory limit of one second foot for each 70 acres, and the acre feet requirement per season as determined. The acreages listed are those dependent upon water drawn from the section during the irrigation season.

TABLE XVII

PRIORITIES IN RELATION TO STATE LINES, ACREAGES, AND REQUIREMENTS IN SECOND FEET AND ACRE FEET WHALEN-TRI-STATE DAM SECTION

		Canal	Priority	Acres	Second Feet	Acre Feet
1.	WYO.	(Grattan	11/1/82	614	9	,639
		(North Platte	9/22/83	3,153	45	3,418
		(Rock Ranch	Spring/84	2,250	32	5,908
		(Pratt Ferris	5/22/86	1,200	17	3,204
				7,217	103	19,169
2.	NEB.	(Tri-State	9/16/87	51,000	729	178,500
		(Mitchell	6/20/90	13,633	195	35,000
				64,633	924	213,500
		(Burbank	11/6/91	292	5	833
3.	WYO.	(Torrington	11/28/91	2,061	29	5,503
		(Lucerne	2/21/93	4,221	60	11,270
				6,574	94	17,606
4.	NEB.	(Ramshorn	3/20/93	994	14	3,000
		(Gering	3/15/97	13,500	193	36,000
				14,494	207	39,000
		(Burbank	3/12/98	20	1	53
5.	WYO.	(Narrows	11/13/99	110	2	334
		(Lingle-Hill (via Interstate)	9/6/01	11,500	164	34,299
				11,630	167	34,686
6.	NEB.	(Tri-State	4/14/02	1,300	19	4,550
		(Wright	4/23/02	110	2	303
7.	WYO.	(Grattan	1/27/04	70	1	187
		(Murphy	4/2/04	100	1	275
		(Grattan	12/2/04	639	9	1,706
				919	13	2,471
8.	WYO.	(Lingle-Hill (via Interstate)	12/6/04	2,300	33	11,655
		(Pathfinder Irrigation (tion District (via (Interstate) Wyoming lands	12/6/04	2,300	33	9,844
		(Goshen Irrigation (District (via Ft. (Laramie)	12/6/04	50,000	714	137,500
				54,600	780	158,999

		(Pathfinder Irriga-				
		(tion District (via				
		(Interstate) Ne-				
		(braska Lands...	12/6/04	84,950[2]	1,213	363,586
		(Gering-Ft. Laramie				
9.	NEB.	(Irrigation Dis-				
		(trict (via Ft.				
		(Laramie)	12/6/04	53,500	764	147,100
		(Northport	12/6/04	4,548[3]	65	19,100
				142,998	2,042	529,786
		(Rock Ranch	1/3/10	822	12	2,195
10.	WYO.	(French	2/20/11	504	7	1,346
				1,326	19	3,541
11.	NEB.	(French	12/21/11	770	11	2,056
12.	WYO.	(French	7/14/15	147	2	392
13.	NEB.	(French	9/11/15	213	3	569
		(French	3/20/20	42	1	112
				255	4	671

[1]The value for Tri-State assumes that the historical interceptions (35,500 acre feet annually) by this canal below the state line will in the future be delivered to the Northport District, in compliance with the decree in U. S. v. Tilley, 124 F. (2d) 850.

[2]98,000 acres minus 10,748 acres supplied by winter diversions to inland reservoirs and minus 2,300 acres of Wyoming lands included in Pathfinder District. Second feet and acre feet requirements are adjusted correspondingly.

[3]This canal supplies a total of 13,000 acres, but 8,452 acres will be supplied in the future by interception below state line. See Note 1.

Crop Production On the Lands Irrigated From Diversions in the Whalen-Tri-State Dam Section

Throughout the section between Whalen, Wyoming, and Bridgeport, Nebraska, there is a general similarity of agriculture, with a trend to greater diversification in passing from West to East. Most of the evidence on the subject relates to the Nebraska areas, and those are the more important from the standpoint of the issues in the case.

The Nebraska lands served by the North Platte Project and State Line Canals lie in the Counties of Sioux, Scotts Bluff, and Morrill. These are also the counties in which Warren Act contract storage water is delivered and used. In these three counties there was irrigated in 1939 sixty-five per cent of all the land irrigated in Nebraska from the North Platte and Platte Rivers and tributaries. Scotts Bluff and Morrill Counties together irrigated 59 per cent, and Scotts Bluff County alone 40 per cent. Of the total irrigated from the main river, these percentages would be much higher.

The growth of irrigation in Scotts Bluff and Morrill Counties is shown by the following figures, representing irrigated acreages in the years designated:

1909	129,745
1919	228,461
1929	281,122

Morrill is not reported for 1899, but the Scotts Bluff County acreage for that year was 29,244.[1]

Capital investment in irrigation enterprises in the two counties was:[2]

1899 (Scotts Bluff County only)	$ 237,161.00
1909	6,541,773.00
1919	9,539,103.00
1929	15,464,813.00

[1] N-211.

[2] N-212. Assessed values of all lands located in the eight Nebraska counties where irrigation is practiced from the North Platte and Platte Rivers are shown on N-214. N-215 gives the production record and value of principal crops in these same counties from 1880 to 1936. The figures given, however, include nonirrigated as well as irrigated crops. N-216 gives the same statistics in five-year averages.

The principal crops cultivated in the area are sugar beets, alfalfa, potatoes, beans, corn, oats, and barley. The production of these crops in Scotts Bluff and Morrill Counties in years separated by ten year intervals from 1910 to 1940, so far as figures are available, is shown in the first two tables following. In the third and fourth tables are shown the production and average rate of yield per acre for alfalfa, sugar beets, beans, and potatoes by five-year periods from 1926 to 1940. Sugar beets and alfalfa production is expressed in tons, all of the other crops in bushels, except that in the third and fourth tables bean production is expressed in pounds.[1]

CROP PRODUCTION, SCOTTS BLUFF AND MORRILL COUNTIES, NEBRASKA

Selected Years

SCOTTS BLUFF COUNTY

	Sugar Beets	Alfalfa	Potatoes	Beans	Corn	Oats	Barley
1910		45,497	544,710		133,648	1,992,375	52,239
1920		105,212	771,968		432,302	609,740	121,940
1930	728,614	96,838	1,730,751	52,365	744,864	580,315	1,244,288
1940	461,580	57,990	6,151,200	276,150			

MORRILL COUNTY

	Sugar Beets	Alfalfa	Potatoes	Beans	Corn	Oats	Barley
1910		7,525	116,187		241,696	135,708	2,283
1920		26,640	25,508		713,616	233,555	16,324
1930	151,326	27,808	231,030	12,903	1,572,815	234,230	503,584
1940	129,320	9,450	649,850	49,525			

[1]N-215, 216, 217, 219; W-140; U. S.-238.

FIVE YEAR AVERAGE PRODUCTION AND RATES OF YIELD

SCOTTS BLUFF COUNTY

	Alfalfa	Sugar Beets	Beans	Potatoes
1926-1930	100,176 (2.84)	671,623 (12.87)	1,640,352 (832)	1,290,413 (168.8)
1931-1935	77,514 (2.10)	531,136 (12.92)	4,790,700 (1033)	2,592,308 (150.1)
1936-1940	68,636 (2.16)	520,586 (14.12)	12,891,720 (1308)	4,367,034 (207.7)

MORRILL COUNTY

	Alfalfa	Sugar Beets	Beans	Potatoes
1926-1930	32,093 (2.73)	169,882 (12.23)	415,260 (682)	127,945 (135.4)
1931-1935	16,770 (1.75)	108,566 (11.55)	605,620 (617)	262,068 (107.2)
1936-1940	15,086 (1.83)	121,696 (12.94)	2,467,920 (1048)	400,894 (153.5)

The acreages devoted to all crops other than alfalfa, beans, beets, and potatoes during the years 1926 to 1938 are shown in Wyoming's Exhibit 140, page 6. The testimony was that in Scotts Bluff County there can be no worth-while cultivation of alfalfa, beets, beans, or potatoes without irrigation; that corn, oats, and barley can be dry farmed with about one-half the yield obtainable from irrigation; that since 1929 there has been but little dry-farm production in these three crops.[1] What is true of Scotts Bluff County is in general true also of Morrill County and southern Sioux County. The statistics given, read in connection with this testimony, are an impressive demonstration of the vital importance and value of irrigation in these western Nebraska counties. Undoubtedly there could have been without it no such agricultural development as has occurred. On the other hand, when scanned for evidence of serious drouth damage since 1931, the statistics are equivocal. It appears that there was a rather sharp reduc-

[1] R. 1124-1132.

tion in the production of alfalfa and sugar beets, but the indication is that this was due to a reduction of acreage rather than of rate of yield. While there was some decline in the production rate of alfalfa, there was a rise in the rate for sugar beets. The acreages devoted to beans and potatoes increased to very closely offset the reduction in beets and alfalfa, the total acreages devoted to the four crops for the three five-year periods, being 124,281, 122,332, and 122,130 respectively.[1] The large increase in total production of beans and potatoes should also be noted. The statistics, taken all in all, are, to say the least, inconclusive as to the existence or extent of damage to Nebraska by reason of the drouth or by reason of any deprivation of water by wrongful uses in Wyoming or Colorado.

Nebraska makes no strong claim for its showing in this regard. Her brief says:

> "* * * the factors involved in the crop statistics which cannot be eliminated largely distort the picture and make it difficult to show one way or the other the effect and results of the shortage of irrigation water upon crop production. However, we believe that when the statistics are properly considered in the light of other factors, they indicate that crop production is seriously damaged when the water supply is low."

Another apparent demonstration of the importance of the part played by irrigation in the economic development of western Nebraska may be seen in its Exhibits 433 and 434, in which the growth of population in eight counties in which irrigation has been practiced is compared with that of six counties without irrigation, the latter lying immediately east and south of the irrigated group. The first or irrigated group of counties shows an increase in popula-

[1] W-140, p. 5.

(Below Bridgeport)	Requirements	Interceptions	River Demand
Browns Creek.....	13,000		13,000
Beerline	2,000		2,000
Lamore	0		0
North River	6,000		6,000
Liscoe	6,240		6,240*
Hannah	200		200
Rush Creek.....	1,200		1,200
Spohn	1,700		1,700
Lyons	3,200		3,200
Oshkosh	2,500		2,500
Midland-Overland	3,000		3,000
Signal Bluff.....	1,500		1,500
Totals	40,540		40,540
Grand Totals...	172,960	29,610	143,350

A study of the requirements and supplies for this section was presented on behalf of Wyoming by its chief engineer and witness, Elmer K. Nelson. Wyoming's Exhibit 164 sets out the estimate and opinion of this witness as to the requirements of the canals in the section. The total arrived at is 145,520 acre feet per season, which is about 2,000 acre feet over the total found as shown above. While there are substantial variations as to individual canals between the findings and the Nelson values, the cumulative totals at any point are not widely apart. Wyoming's Exhibit 177 shows in detail the location of all channel and tributary accretions to the river in the section, and Wyoming's Exhibit 178 sets up the accretions for the 1931-1940 period against the diversion requirements of the canals in

*Without deduction for diversions from Cold Water Creek.

the section.[1] Together these exhibits furnish an apparent demonstration that the local supplies, even during the drouth period, were adequate to the needs of the canals without calling upon up-river water. Neither the supply data nor the mathematics of these exhibits is questioned by Nebraska. Only the adequacy of the assumed requirements is disputed. These requirements are so close to those found herein that the conclusion would not be affected if the one set of requirements were substituted for the other.

These analyses are on a seasonal basis and are consistent with the possibility of shortages within each season. In fact, the Nebraska evidence shows that such shortages did occur during the years 1931 to 1936, and no doubt also occurred in later years. The explanation of these shortages in the face of apparent adequate seasonal supplies is probably to be found in one or more of three causes: (1) lack of coincidence between the time and quantity of supplies and the time and extent of needs; (2) excessive uses by some canals at the expense of others; (3) withdrawal of water from the section as a matter of priority administration, to supply senior canals below, the effect being aggravated by the transportation losses involved. The situation which occasioned these efforts to supply the lower canals has now been largely, perhaps wholly, eliminated by the construction and operation of the Kingsley and Sutherland Reservoirs.

In addition to the local supplies in the section there undoubtedly will always be, regardless of regulation, substantial quantities of water passing Tri-State Dam usable in the Tri-State - Bridgeport section. In the 1931-1940

[1]Testimony concerning these exhibits will be found: Re W-164, R. 27480-27505, 27717-27729; re W-177, R. 27582-27587; re W-178, R. 27587-27591.

period, with no limitation on Wyoming uses for the benefit of Nebraska, the mean divertable flow passing Tri-State Dam for the May-September period was 81,700 acre feet.[1]

Two of the canals in the Tri-State - Bridgeport section (Central and Chimney Rock) and two in the Kingsley - Bridgeport section (Browns Creek and Beerline) have supplemental storage supplies under Warren Act contracts.

The conclusion is that Nebraska's claim for equitable apportionment of water originating above the Wyoming state line is in all events limited to the North Platte Project and State Line Canals and the lands supplied by them.

Kingsley Reservoir to Kearney

There are 14 main river canals in this section, six diverting between Kingsley and North Platte and eight between North Platte and Kearney. The land irrigated consists of 131,482 acres as claimed by Nebraska, but amounts to only 86,297 acres according to the claim of Wyoming, a difference of 45,185 acres. It appears unnecessary to resolve this dispute. Assuming the irrigated acreage to be as asserted by Nebraska, the evidence negatives any equitable right of these lands to participate in any distribution of water under an interstate decree.

The whole aspect of water supply for this section has been changed in recent years through the construction and operation of the Sutherland and Kingsley Reservoirs. The Sutherland is under contract to supply 100,000 acre feet per annum of storage water to the eight canals east of North Platte. The Kingsley Reservoir is the foundation of the so-called Tri-County Project intended to bring under

[1] W-180; R. 27596.

irrigation an additional 200,000 acres of land lying east of North Platte. The water conserved by this reservoir will not only supply these lands, but will leave available a surplus sufficient to fully supplement the natural flow for all canals east of Kingsley. Also incident to the operation of the Sutherland and Tri-County Projects there will be a large saving of transportation losses by delivery of water through the supply canals of the project instead of by transportation over the river bed.

A thorough study of this section, including the prospective operation of Kingsley Reservoir, was made and the resultant conclusion testified to by Donglas G. Wright, civil engineer, employed as principal engineer for the Power Division of the Federal Public Works Administration. At the time of the study he was assistant chief project engineer in the construction of all power and irrigation projects in Nebraska financed by the Public Works Administration. His study was made to serve as a basis of financing (or refinancing) of the Sutherland, Tri-County, and Columbus Projects in Nebraska.

To test the sufficiency of the supply as augmented by the two reservoirs, Mr. Wright made a study to determine what would have been the result had the reservoirs been in operation from 1930 to 1940. He started with a hypothetically empty Kingsley Reservoir in 1930 and immediately imposed against the historical supply a full load for irrigation and power. The conclusion was that under the assumed operation there would have been during the period (the driest of record) an adequate supply for the power features of the Sutherland and Tri-County Projects, for the irrigation of all lands under existing canals east of Kingsley, for the irrigation of the Tri-County Project lands, and

for the accumulation of storage water at the average rate of 48,680 acre feet a year, with a balance of storage at the end of the period of 425,000 acre feet.[1]

According to Mr. Wright's computations, assuming operation of the two reservoirs during the eleven-year period, there would have been available for use east of Kingsley an average annual gross supply of 1,250,000 acre feet and an average annual net (after deducing the uncontrolled flows of the South Platte) of 1,200,000 acre feet. This Mr. Wright distributed as follows:

For power	246,000
Reservoir and canal losses	360,000 acre feet
To supply deficiencies of canals between Kingsley and North Platte	14,287
To supply Sutherland contracts	100,000
Used by canals between North Platte and Kearney exclusive of Sutherland storage water	147,900
For Tri-County Project	205,000
Total distribution	1,073,187
Total net supply	1,200,000
Surplus above all needs	126,813 acre feet

By reason of use of round figures for exact figures, Mr. Wright's final surplus was 95,000 acre feet.

Mr. Wright's calculations appear correct and his conclusions conservative. For the six canals heading between Kingsley and North Platte he adopted the acreage claimed by Nebraska and assigned to it a diversion rate of three acre feet per acre, which is well above its actual needs. For the eight canals east of North Platte, the average natural

[1] U. S.-186 to 191, inclusive; R. 25569-25759.

flow, plus 100,000 acre feet of storage water, affords a total annual supply of 247,900 acre feet, which for the full acreage claimed by Nebraska would represent a diversion rate of 2.65 acre feet per acre and for the acreage as claimed by Wyoming 4.67 acre feet per acre. West of Bridgeport a rate of 2.6 acre feet per acre was found adequate. The land requirements in this section are naturally somewhat lower, because of location in an area more humid, the seasonal precipitation at North Platte being four inches higher than at Bridgeport.

No one has disputed the accuracy of Mr. Wright's analysis or the soundness of his deductions. From his testimony and other evidence, it appears manifest that if this section ever had any equitable claim upon water from the upper States the basis of such claim has been nullified by the supply of storage water now available from the reservoir system installed at the head of the section.

POSITION OF THE PARTIES AT THE CLOSE OF THE CASE AND NATURE OF DECREE PROPOSED.

At the close of Nebraska's case, and again after the evidence was completed, Colorado noted in the record a motion for dismissal of the suit.[1] Wyoming noted a similar motion for a dismissal at the close of Nebraska's case,[2] but did not renew it at the final close of the evidence and on the contrary then took the position that there should be an affirmative decree of distribution. This position has been adhered to except that in oral discussion counsel for Wyoming once indicated that if interstate distribution were to necessitate a segregation of natural flow and stor-

[1] R. 15237-8, 15846-8, 29471.
[2] R. 15229-37.

age water, a dismissal might be preferred. Nebraska and the United States have consistently urged an affirmative decree. Each of the parties submitted a plan of apportionment, the proposal by Colorado being contingent upon the denial of her motion for dismissal.

Nebraska urges the setting up of a complete interstate priority schedule for all the river from North Park, Colorado to Bridgeport, Nebraska and a unified administration of the river in accordance with that schedule.[3] She concedes that "in the section above Pathfinder Reservoir there usually need only be interstate administration for the purpose of supplying water to the Pathfinder and protecting it against the encroachments of juniors upstream". The interstate administration was under this plan to be in charge of a "coordinator". In advocating this solution Nebraska relies primarily on the authority of *Wyoming v. Colorado*, 259 U. S. 419.

The United States advocates apportionment on a basis including both mass allocation and an interstate priority schedule. The mass allocation feature would require minimum deliveries by Colorado at Northgate and by Wyoming at Pathfinder, and would require the maintenance of minimum gains between Pathfinder and Guernsey. The priority schedule would apply to the Whalen-Tri-State Dam section. The minimums were defined in terms of three, five, ten, and fifteen-year "moving averages", each average being the historical minimum for the like period.

Wyoming proposes allocation by operation of the following limitations on uses: (1) Colorado transbasin diver-

[3]This represents a modification of Nebraska's original position, which was that interstate priority administration should extend downstream "as far as shortages of senior canals occur". Nebraska's evidence showed shortages as far downstream as Kearney.

sions, maximum annual, 6,000 acre feet; (2) Kendrick Project and Wyoming private canals, Alcova to Nebraska state line, 259,000 acre feet; (3) French Canal (Wyoming and Nebraska lands), 4,471 acre feet; (4) Ft. Laramie and interstate canals, 624,800 acre feet; (5) Nebraska State Line Canals (Mitchell, Gering, Tri-State, and Northport), 236,800 acre feet (272,300 minus 35,500 interceptions); (6) inland reservoirs of interstate canals, 65,000 acre feet. All quantities are for the May-September period except that for the inland reservoirs, which is for October-April. Proration of shortages between the water funds designated under (2), (3), (4), and (5) was suggested. While Wyoming contends that no limitation on future irrigation development above Pathfinder in either Wyoming or Colorado is necessary or proper, she suggested that if some limitation is to be imposed it might restrict Colorado to the irrigation in the basin of an additional 17,000 acres and Wyoming to an additional 51,000 acres, making a total of 68,000 acres.

Colorado's plan included: (1) Limitation on Colorado's exportations from the basin to 120,000 acre feet in any period of ten consecutive years; (2) limitation on Colorado, Wyoming, and United States to such uses in the basin as would not reduce the flow at Whalen below 9,000,000 acre feet for any period of ten consecutive years; (3) deliveries of storage water according to contracts; (4) delivery of direct flow in Whalen - Tri-State Dam section to canals in the section "in accordance with their relative rights, regardless of state line". It was suggested that "in this area administration on the basis of priority might well be applied".

NEBRASKA'S THEORY OF CASE. VIOLATION OF HER PRIORITIES—DAMAGE.

Nebraska's evidence was directed mainly to proof of a case under the doctrine of *Wyoming v. Colorado.* She took her stand squarely upon the ground that as between States enforcing within their own borders the rule of priority of appropriation that rule should be the sole basis, measure and test of equitable apportionment. She amassed a large volume of evidence intended to show diversions by Wyoming, Colorado, and the United States, and particularly by Wyoming, in violation of the priorities of her appropriators. As originally presented, this evidence purported to cover all violations of Nebraska priorities by Wyoming diversions, including those of the North Platte Project canals and reservoirs, during the years 1931 to 1936, inclusive. The evidence appeared to show as the total of such diversions and storage 475,000 acre feet during the period.[1] A value was then placed upon this quantity of water by an expert witness, who testified that for irrigation purposes a reasonable unit value would be from $4.00 to $6.00 per acre foot, and that consequently the loss to Nebraska from the diversions complained of was from $300,000 to $400,000 per year. The value of a permanent water right equivalent in quantity to the average annual loss to Nebraska was said to be about $3,000,000.[2] This was the only specific evidence as to the extent of Nebraska's damage.

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[1] N-325 is a summary for the period and enumerates previous exhibits in the series. See also N-536-556. The total "out of priority" diversions figure includes those of the Mitchell Canal, which supplies Nebraska land exclusively, and those of the French Interstate and Ft. Laramie Canals, which supplies lands both in Wyoming and Nebraska.

[2] R. 1523-1531.

There are several flaws in the Nebraska "out of priority" study which tend to impair its validity. It is probably unnecessary to analyze them in detail. Since the conclusion has been reached that Nebraska canals below Tri-State Dam may be excluded generally from consideration, they may also for present purposes be eliminated from the "out of priority" claim. On request Nebraska analyzed her "out of priority" evidence to bring out separately the violations of the State Line Canals priorities after reducing their assumed requirements to substantially the level adopted herein. In relation to these canals the total Wyoming "out of priority" diversions for the seven years 1931 to 1937 appear from the Nebraska revision to have been 231,968 acre feet, or an annual average of 33,138. This again includes "out of priority" diversions claimed against the Mitchell Canal. This is upon the theory that although the canal supplied only Nebraska land its headgate was controlled by Wyoming, and that permitting diversions by it "out of priority" tended to disrupt Nebraska administration. Whatever justification there may have been for charging Wyoming with the Mitchell diversions prior to 1936, her responsibility terminated in August, 1935, when control of the canal passed to Nebraska. The total "out of priority" diversions charged to this canal in the revised claim are approximately 26,000 acre feet. Deducting this quantity, the remainder is 205,968 acre feet, or an annual average for the seven years of 29,424 acre feet.

Wyoming canals are of course in any event chargeable with "out of priority" diversions only when senior Nebraska canals are short of water. In the computations by which the foregoing totals were arrived at, only the natural flow was taken into account, storage water supplies avail-

able to Nebraska canals being disregarded. This was upon the theory that a senior short of natural flow may demand the closing of a junior regardless of the availability to the senior of storage water; that when short of natural flow it is optional with the senior, as between him and the junior, whether to use or conserve the storage. That this is a sound legal principle in intrastate administration in both States is not open to question, but that it must be applied in arriving at an equitable apportionment between States depends on whether priorities alone are to control. Nebraska made an alternative analysis in which its canals are charged with the storage water received. On that basis the total out of priority diversion by Wyoming is reduced to 147,968 acre feet for the seven-yearf period, or an average of 21,138 acre feet a year. In this revised analysis most of the infirmities in Nebraska's earlier study are eliminated. However, it is to be noted that the 205,968 acre feet remaining after deduction for Mitchell and before allowance for storage water includes 45,552 acre feet diverted by the Interstate, Ft. Laramie and French Canals, which supply lands in Nebraska as well as in Wyoming, and 23,320 acre feet diverted for storage in Pathfinder and Guernsey Reservoirs which is for the benefit of both Nebraska and Wyoming lands.[1] Nebraska's complaint about these diversions is that they interfere with Nebraska administration and deliver water to Nebraska junior appropriators that rightfully belongs to Nebraska seniors. Disregarding Nebraska's participation in this "out of priority" water and assuming in accordance with the Nebraska testimony that this water can be evaluated by volume and that a rate of $4.00 to $6.00 per

[1]These figures are for 1931 to 1936. For 1937 Interstate and Ft. Laramie in the Nebraska revision are combined with Lingle & Hill.

acre foot is a reasonable appraisal,—and there is no contrary testimony,—and taking $5.00 per acre foot as a medium value, the loss to Nebraska on the first basis (excluding storage water) would be for the period $1,029,840, or an average of $147,120 per year. On the second basis (charging Nebraska canals with storage water) the corresponding amounts would be $739,840 and $105,690. Nebraska argues that this reduces her violation of priority damage to its lowest possible terms and that there is justification for substantially higher figures.

It is of course obvious in general and without any detailed proof that in an arid or semi-arid country deprivation of water for irrigation in time of need cannot be otherwise than injurious to the area deprived. The weakness, if such there be, in Nebraska's proof is uncertainty as to the *extent* of any invasion of her equitable share except as measured by diversions "out of priority" and uncertainty as to the *extent* of her injury consequent upon the alleged violation of her equitable rights, except as measured by the dollar value assigned to the water lost to her through such diversions. If to sustain her burden of proof Nebraska must establish not only violations of her priorities or infringement otherwise on her equitable share by the other States, but also that as a result she has suffered injury of great magnitude in the broad sense of serious damage to her agriculture or industries or observable adverse effects upon her general economy, prosperity or population, then her proof has failed, for these is no clear evidence of any of these things.

The Nebraska's "out of priority" studies did not extend to the area above the Pathfinder Reservoir, although she

claims large "out of priority" diversions in North Park, Colorado and in Wyoming section between Colorado state line and Pathfinder Reservoir. The evidence on this is reviewed in the discussion of these sections.

LAW OF THE CASE.

The jurisdiction of this Court to entertain this suit is too clear to require elaboration. *Kansas v. Colorado,* 206 U. S. 46; *Missouri v. Illinois,* 180 U. S. 208; *Wyoming v. Colorado,* 259 U. S. 419. General underlying principles of law applicable to the controversy include the following:

The States appear as *parens patriae,* trustee, or representative of the citizens whose interests are involved. *Missouri v. Illinois,* supra; *Kansas v. Colorado,* supra.

There is to be applied federal, state, interstate or international law, as the exigencies of the case may require. *Kansas v. Colorado,* 185 U. S. 125, 206 U. S. 46, 97; *Connecticut v. Massachusetts,* 282 U. S. 660, 670.

Controversies between States are to be adjudicated on the basis of "equality of right", which means that "the principles of right and equality shall be applied, having regard to the equal level or plane on which all the States stand in point of power and right under our constitutional system". *Connecticut v. Massachusetts,* supra; *Wyoming v. Colorado,* 259 U. S. 419, 465; *Kansas v. Colorado,* 206 U. S. 46, 97.

No State may assume to appropriate and use the water of an interstate stream in disregard of the rights of other States or appropriators below her boundary. The latter are entitled to an equitable portion of such water or an equitable apportionment of the benefits thereof. *Kansas v.*

Colorado, supra (103-105); *Wyoming v. Colorado,* supra (466).

This Court will not, generally speaking at least, exert its extraordinary power to control the conduct of one State at the suit of another, unless the invasion or threat of invasion of right be of serious magnitude and be established by clear and convincing evidence. The burden on the complainant State is heavier than that which rests upon a plaintiff in a suit between private litigants. *Missouri v. Illinois,* 200 U. S. 496, 521; *New York v. New Jersey,* 256 U. S. 296; *North Dakota v. Minnesota,* 263 U. S. 365, 374; *Connecticut v. Massachusetts,* supra; *Washington v. Oregon,* 297 U. S. 517, 522; *Colorado v. Kansas,* 320 U. S. 383.

Query: Is there an exception to or modification of this rule (established by *Wyoming v. Colorado*) in cases involving disputes over interstate waters where the States involved have adopted the rule of priority of appropriation and it appears that this rule is being violated by one of the States?

In only two cases involving rights in the waters of interstate streams did this Court lay down any concrete rule for the determinaton of equitable apportionment. In each of these cases both litigant States had adopted the doctrine of priority of appropriation: In the case of *Wyoming v. Colorado,* supra, this Court said of the appropriation doctrine that "it furnishes the only basis which is consonant with the principles of right and equity applicable to such a controversy as this is.[1] * * * The principle on which it proceeds is not less applicable to interstate streams and

[1]It might be suggested that the breadth of this declaration is qualified by the language "such a controversy as this is," but these words, read in their context, would seem to refer primarily to the fact that the suit was between two States, both enforcing the priority rule.

controversies than to others." The view thus announced was re-emphasized in a later suit brought by Wyoming against Colorado (286 U. S. 494), complaining of an alleged violation of the prior decree. In the latter case the Court took pains to point out that in the former suit there was in issue all the appropriations and priorities of the one State as in opposition to all those of the other, and reaffirmed what had been said in the earlier opinion as to priority of appropriation having been the sole basis of decision.

In *Washington v. Oregon,* supra (526), it was said of the final issue in the case:

> "The question remains whether the Oregon irrigators as a result of all their acts are taking to themselves more than their equitable proportion of the waters of the river, *priority of appropriation being the basis of division.*"

In the case of *Kansas v. Colorado,* 206 U. S. 46, Kansas was held to be a riparian right State. In *Colorado v. Kansas,* supra, it appeared that the doctrine of appropriation had been adopted in Kansas to a limited extent, but doubt remained as to the right of nonriparian owners to appropriate waters against objection by other such owners. Of the equitable rights of the States, the Court said:

> "And in determining whether one State is using or threatening to use more than its equitable share of the benefits of a stream *all the factors which create equities in favor of one State or the other* must be weighed as of the date when the controversy is mooted."

The following additional decisions of this Court involved controversies between States regarding interstate waters:

South Carolina v. Georgia, 93 U. S. 4 (obstruction of navigation); *Tennessee v. Arkansas,* 249 U. S. 588 (flood damage); *North Dakota v. Minnesota,* 256 U. S. 220 (flood damage); *South Dakota v. Minnesota,* 263 U. S. 365 (flood damage). Involving disputes over the diversion and use of water from interstate streams were *Kansas v. Colorado,* supra; *Connecticut v. Massachusetts,* supra; *New Jersey v. New York,* 283 U. S. 336; *Arizona v. California,* 283 U. S. 423; *Arizona v. California,* 298 U. S. 558; *Washington v. Oregon,* supra; *Colorado v. Kansas,* supra.

Except in so far as the rule of priority may control, there is no definite standard, test, or criterion by which the equitable shares of States in an interstate stream can be measured out. Apportionment calls for the exercise of judgment from consideration of numerous factors. Even the selection of the factors is largely a matter of judgment, for there is no authoritative enumeration of them. They should include, no doubt, such matters as the extent of land irrigated and irrigable, dependence upon irrigation, volume of water produced and available in each area, diversions, duty of water, consumption, depletion, return flows, sufficiency of supply, industries served and economic results of irrigation, economical or wasteful practices, effect of wrongful uses upon lower areas, effect of the imposition of any limitation upon upper areas in comparison with benefits to lower areas, additional areas awaiting development, and the effect of extension of irrigation thereto. A rule that would seem elementary in equitable distribution (even aside from legal rights based on priority statutes) is that present rightful uses should be preferred to prospective uses under possible future development.

Is this case governed by the rule usually applicable to suits between States which lays down as among the prerequisites of relief (a) invasion of right, (b) resulting injury of great magnitude, and (c) clear and convincing proof, or is the case distinguishable from those in which that rule has been applied. Possible points of distinction which suggest themselves are:

First. The effect upon the rights and remedies of the litigating States of the doctrine of priority of apportionment in force in each of them. The case of *Wyoming v. Colorado* was decided by application of this doctrine. In that case the quantiy of water which Colorado might take by the diversion in dispute consistently with the priority rule was determined, and she was enjoined from exceeding that quantity. The question of the extent of threatened injury to Wyoming apparently was not particularly inquired into. There were some general observations in the opinion that both States were in the arid region where irrigation was commonly practiced, that both States had the same need of water, and that irrigaion was important to the welfare and prosperity of the Laramie Valley. There was, however, no discussion as to what the effect on Wyoming might be if Colorado were permitted the full amount of the diversion claimed by her or any amount above that allocated to her by the decree. This raises the question as to whether as between States which have adopted the priority rule violation of that rule by one State does not entitle the other to equitable relief without a particularized showing of resulting injury of great magnitude.

Second. In their pleadings (which stand unamended) all parties ask for equitable apportionment, and after the close of the evidence all parties (Nebraska, Wyoming, and

the United States) except Colorado still urge apportionment and contend that the pleadings and evidence present a justiciable controversy requiring an affirmative decree even in the absence, if there be such, of a showing by Nebraska of such serious invasion of her rights as would justify injunctive relief in her favor. This demand for apportionment would appear necessarily to contemplate and imply consent to injunction restraining diversions or use of water contrary to the terms of the apportionment. Wyoming, while denying any wrongful diversion by her to the injury of Nebraska, offers to submit to certain limitations upon her own diversions and use of water. She claims, on the other hand, that there is an invasion of her rights, actual and threatened, by Nebraska that can be prevented only by an equitable apportionment between the States. She demands that the rights of North Platte Project Canals and Nebraska State Line Canals be defined and limited, and argues that unless that be done excessive diversions by these canals will operate unduly to reduce "carry-over" storage and make for subsequent shortages in supply. The United States suggests that Nebraska should be enjoined from intercepting return flows for her Tri-State Canals controversy to the holding of *United States v. Tilley*, 124 F. (2d) 850.[1] It was suggested that if no other form of affirmative decree were warranted, a declaratory judgment might be entered.

Third. Several unique factors are presented, not encountered in other cases, such as: (a) the large appropriations and diversions in Wyoming for the benefit of Nebraska lands; (b) the physical control by Wyoming or the

[1] It is assumed that injunction was issued by the District Court in accordance with the decision of the Circuit Court of Appeals and that therefore no injunction in this suit is necessary or proper.

United States of diversion works in Wyoming which regulate distribution of water to Nebraska users; (c) the joint use of canals for supplying lands in both States; and (d) the great concentration of requirement for both States in the short Whalen - Tri-State Dam section. All of these circumstances render the Wyoming-Nebraska boundary a particularly artificial line of division for the purpose of practical administration of the water supply of the last mentioned section.

On the very important question as to whether the principle of priority should rule this case, my conclusion is that a right decision cannot be rendered solely on the basis of priorities, and that a decree so based would not be wholly equitable or accomplish equitable distribution. Among the factors opposing the strict application of the priority rule are the very large number of appropriations involved, the great distances between points of diversion, and the wide diversity between the States in respect to (a) physical and climatic conditions; (b) the industries dependent upon irrigation; (c) uses and duty of water; (d) character and rate of return flows; (e) irrigation practices and legal policies.[1]

On the other hand, the emphasis given the priority rule in *Wyoming v. Colorado* and the fact that it was there followed and applied would seem to dictate its application here so far as feasible and not inconsistent with fundamental equity. If the conclusion be correct that Nebraska, for the purpose of this case, is to be regarded as an appropriation State, then this case in its facts would appear more closely aligned with *Wyoming v. Colorado* than with

[1]This subject is more fully covered in the discussion of the interstate priority schedule proposed by Nebraska, page 113, post.

Colorado v. Kansas. A general rule might be formulated that would give appropriate recognition to the decisions in both of these cases. Depending upon the emphasis to be placed upon the priority rule, it could be stated thus:

> The rule to be applied is that of priority of appropriation except where the result would be inequitable in the light of "all the factors which create equities in favor of one State or the other".

Or thus:

> Equitable apportionment shall be arrived at by weighing "all of the factors which create equities in favor of one State or the other, including as one of the major factors the principle of priority of appropriation.

At any rate, unless the decision in *Wyoming v. Colorado* is to be overruled, priorities must be regarded as one of the major factors bearing upon equitable apportionment.

PROPOSALS OF THE PARTIES AS TO FORM OF DECREE—ANALYSIS AND CRITICISM.

Nebraska proposes a unified interstate priority administration. Admittedly, there is no precedent for this. The nearest approach to it is the enforcement decreed in some cases of priorities as between individual appropriators in different state.[1] *Wyoming v. Colorado* applied the priority principle, but decreed nothing in the nature of a unified interstate administration. Such effect as it gave to priorities was by the method of mass allocation. That there is here no such possibility is conceded. The impossibility is strongly emphasized by Nebraska's Exhibit 432, which shows that the priorities on the main river fall into 113

[1]Bean v. Morris, 221 U. S. 485; Weiland v. Pioneer Irrigation Co., 259 U. S. 498; Wyoming v. Colorado, 259 U. S. 419, 470. See Rickey Land and Cattle Company v. Miller, 218 U. S. 258.

different brackets or categories alternating among the three States and presenting insuperable difficulties to any attempt to make corresponding mass allocation of water. Even though priorities below Tri-State Dam be eliminated, the difficulty would still be prohibitive. The physical obstacles to such administration have been referred to. From Cameron Pass to the Wyoming-Nebraska State Line is 507 miles, and to Bridgeport 567 miles. The flowage time for water to pass from North Park to Bridgeport is between two and three weeks.[1] To close a particular canal in North Park to relieve the shortage of a senior in Nebraska would involve the speculation as to whether the water released in North Park would arrive at the Nebraska headgate in time to relieve the shortage before the damage was completed or before the shortage was relieved from other sources. The Colorado closing might work a serious injury to the North Park appropriator with no corresponding benefit to the Nebraska user. This is an extreme illustration of one of the incidents inherent in priority administration which would be exaggerated with the extension of such administration across state lines. Also inherent in priority administration is loss of water by evaporation and channel percolation while in transit from upper to lower points. The lower appropriator receives less than the upper appropriator is deprived of. Projecting such administration over greater distances would naturally enhance such losses. A final objection to the imposition at this late

[1]Other estimates of time for water to pass from upper to lower points are from Pathfinder to Nebraska state line, four to four and one-half days; from Pathfinder to "between Kearney and North Platte" ten days to two weeks; from Pathfinder to North Platte about twelve days, plus three days more in low water. Nebraska's administration is based on a flow rate of 25 miles a day. This, however, would not be applicable to the upper river. R. 554-5, 560, 564, 567, 758, 877, 886, 1196, 1241, 1304, 1479, 1486, 14034.

day of a river wide priority administration is the great disturbance of long established uses that would inevitably result.

Differences of condition in the States prohibit a uniform rule of water administration. From the upper to the lower valley there is a consistent lengthening of the irrigation season; there is a progression downward in the diversion rate but a progression upward in the rate of consumptive use. The variation in requirement is reflected in the nature and extent of appropriations permitted. Colorado imposes no legal limitation, the amount being left to the discretion of the Court rendering the decree. In practice, the decrees average one second foot for each 20 acres. In Wyoming and Nebraska the limitation is one second foot for 70 acres. In respect to agriculture North Park, with its single industry of cattle raising, contrasts with western Nebraska, where there is general crop diversification. Striking also is the contrast in the size of irrigation projects between the small individual developments in Colorado and in Wyoming above Whalen and the great irrigation districts on the main river below Whalen, particularly in Nebraska.

An interstate priority schedule would necessarily interfere with the freedom of each State in the intrastate administration of the State's share of the water. It would have the effect of fixing the rights of appropriators within each State as between each other. Constitutionality of a decree having this effect would appear to be open to serious question in view of the absence of the appropriators as parties to the case.

The method of apportionment suggested by Wyoming, Colorado, and the United States are all subject to the

objection of inflexibility. Interstate priority administration, if not ruled out on other grounds, would provide greater flexibility than any of the other methods proposed. Next the moving averages of the United States plan would be least objectionable from this standpoint. However, the requirement of minimum deliveries, even with the latitude permitted by the moving averages, seems wrong in principle. The obligation of the upper States to make prescribed deliveries would not depend upon availability of water to deliver. The plan makes insufficient allowance for the vital element over which the States have no control, viz., variations in precipitation. The hardship of this is minimized by limitation of the required deliveries to the historical minimums, but this in turn is open to the objecton that it has the effect of awarding to the upper areas all water in excess of the historical minimums, which in all instances, except that of the fifteen-year average, would be dry cycle minimums. Unless the supplies of the future should fall below the historical minimums, the United States plan would not operate as any limitation at all on the river sections above Guernsey, since the minimum run-offs were themselves not due to any limitation or regulation but to physical unavoidability. They represent water which the appropriators of the sections in question either did not want or for some reason could not divert.

The Wyoming plan would so restrict diversions between Pathfinder and the Tri-State Dam as to limit the total, including the Kendrick Project, to 1,120,400 acre feet per season. All water, if any, in excess of this total would presumably be either free water or would go to Nebraska for use below the Tri-State Dam. There was a suggestion

that shortages be prorated. How this could be done is not clear. The limitation and distribution being on a seasonal basis, shortages could be determined only at each season's end—too late for proration. As compared with the proposed limitation of 1,120,400 acre feet, the total seasonal requirement as found herein for the same canals is 1,275,000 acre feet.[1]

The Wyoming plan presupposes distribution of natural flow and storage water, indiscriminately as a common fund, to all users, whether possessed of storage contracts or not. This is predicated on the theory that there is sufficient water for all, and hence no necessity for segregation. The lack of such sufficiency under actual administration since 1931 has plainly appeared. That there would have been a sufficiency even under strict interstate regulation with limitation of all users to the requirements herein found and pooling of natural flow and storage water is at least doubtful. Therefore, even assuming that under a demonstration of sufficiency of total supply the storage contracts could be ignored, I think such demonstration is lacking and that the pooling of storage and natural flow water for the purpose of a general apportionment is not possible.

Colorado proposed such limitation on Colorado, Wyoming, and United States uses in the basin as would not reduce the flow at Whalen below 9,000,000 acre feet (understood to include natural flow and storage) for any period of ten consecutive years, and proposes delivery of storage water according to contract. Since the uses by Colorado, Wyoming, and the United States are several and not joint, a joint limitation would be ineffectual. The required av-

[1]Made up of 168,000 for Kendrick, 85,000 for Alcova to Whalen section, and 1,072,000 for Whalen-Tri-State Dam section.

erage delivery at Whalen of 900,000 acre feet a year compares with an average 1904 to 1940 flow of 1,558,900 acre feet and an average 1931-1940 flow of 1,105,110 acre feet. In other words, the proposed average delivery would be 205,110 acre feet below the average run-off of the dry cycle. Of the 1931-1940 average, roughly 60 per cent was storage water. Although Colorado recognizes the necessity of a separate administration of storage water, the obligation of delivery at Whalen is in terms of all water—natural flow and storage—which makes the limitation on natural flow users above Whalen depend to an important extent on the quantity of storage water deliverable at Whalen.

Under the Colorado plan all water above that necessary to deliver 900,000 acre feet average at Whalen would be usable above and in effect be allocated to the upper sections. This excess during the 1931-1940 period would have been 205,110 acre feet annually and on the basis of the 1904-1940 average would have been 658,900 acre feet annually. There is no provision for sharing such excesses with users below Whalen. It is proposed that Colorado, Wyoming, and the United States should not be required to make up deficiencies if the flow at Whalen should fall below 9,000,000 acre feet in any period of ten consecutive years "due to lack of precipitation in the water producing areas". This qualification would be incapable of practical enforcement unless something in the nature of a standard precipitation rate were specified which would permit a determination of whether a deficiency at Whalen was to be attributed to lack of precipitation or to excessive uses in the upper areas.

The Wyoming and Colorado plans particularly illustrate the rigidity inherent in all mass allocations in fixed annual

or seasonal quantities with no device for making the distribution responsive to changes in supply.

PROBLEMS PRESENTED BY THE "DRY CYCLE" AND OTHER UNCERTAINTIES—ALTERNATIVES RESPECTING DECREE.

Comment has been made on the character of the current drought period. It is unprecedented in length and severity. To apportion a water supply or to determine whether there need be any apportionment, it is essential to know what water supply is being dealt with or to indulge in some assumption as to what it will be. Any plan of water distribution en masse during the decade preceding 1931, based either upon the conditions then prevailing or upon previous long-range experience, would have completely broken down during the low water years following 1930. And any similar allocation based on 1931-1940 conditions might prove equally unsuitable for the 1945-1955 decade. In the light of the experience of the 37 years ending in 1940, what is the dependable flow of the river at any point? Any determination supported by reason is next to impossible. Any conclusion would have to be largely arbitrary. Logically, it would either have to be based on the dry cycle on the theory that that cycle has become so extended that it must be accepted as a new normal, unless and until there is an emergence from it, or it would have to ignore the dry cycle as a transitory phenomenon and be based on the preceding history of supply. Either assumption would be speculative and poorly justified. How much longer the present cycle may reasonably be expected to run or whether there is indicated a trend that may continue indefinitely is a subject on which no witness assumed to express an

expert or other opinion.[1] Any attempt to establish a level of dependability that would reflect the conditions of both periods would inevitably produce a false level for the future.

The wide and constantly occurring fluctuations in supply from day to day, month to month, year to year, and decade to decade, call for flexibility in any scheme of distribution, so that there may be an equitable sharing both of large supplies and of various degrees of deficiency. But what can be accomplished in the way of flexibility is limited. All parties agree that there are no "key" points or stations on the river where any scheme of distribution could be installed that would be automatically responsive to variations in supply.[2] Obviously there could be little flexibility in any method of distribution based alone on fixed limitations on the upper states, whether imposed by prescribing maximum uses or requiring minimum deliveries. A flexible method of allocation for limited sections is entirely feasible. One such method will be proposed for the vital Whalen-Tri-State Dam section. But to achieve flexibility in any general scheme of apportionment of the river system as a whole was confessedly beyond the ingenuity of any of the able engineers who testified in the case. Whether the sectional method to be proposed is one to be imposed by judicial decree will be a question for consideration.

Besides the problem of the "dry cycle", there are a number of other uncertain factors now difficult of appraisal. Since this suit was started additional reservoirs have been installed on the river with an aggregate storage capacity of 3,400,000 acre feet, intended to conserve water for the

[1] On this subject see reference to study by Professor Nels A. Bengston, in footnote 4, page 40, ante.
[2] The use of such "key" stations is a feature of some of the interstate compacts.

irrigation of 271,000 additional acres. What will be the result of this additional storage and irrigation? Wyoming and Colorado argue that the net result of the Kendrick Project will be important benefit to downstream users; that flood waters in excess of the capacity of Pathfinder will be conserved in large quantities, and after being subjected to consumptive use on the Kendrick land will yield a very considerable residual return flow available downstream. Nebraska, on the other hand, contends that the operation of the Seminoe and Alcova Reservoirs and the demands of Kendrick irrigation, at least unless strictly regulated on a priority basis, will adversely and seriously affect the supply of Nebraska users. The effect of the operation of this project or whether it can operate at all will depend on what the future supplies shall be. The full effect of the operation of the Sutherland and Kingsley Reservoirs (in connection with the unified Tri-County, Sutherland, and Loup River Projects) is yet to be seen.[1]

The large water supplies of former years encouraged extravagant uses. More economical practices, compelled by recent low water years, can measureably compensate for the reduction in supply. There are possibilities of reduction in canal losses. The further effect of the silting or desilting action of water, particularly with respect to the Guernsey Reservoir, is a subject of disagreement among the engineers. How far the full effect of the completion of ground water storage has yet been experienced is open to some question.

All of these and other elements of uncertainty and impermanence in the present situation throw doubt on the wisdom of attempting now to make a final or unalterable

[1]R. 25582, et seq.

distribution of the water or benefits of the river or of rendering any unamendable decree with respect thereto. They suggest one of two courses: *First,* a dismissal of the present suit without prejudice to the right of any party to institute a new suit for equitable distribution when conditions have attained a state of greater stability and there is more assuring evidence as to what the future "normal" is to be; *second,* the entry of a decree based primarily on present conditions, with retention of jurisdiction to modify the decree on a showing of such change of condition as to render operation of the decree inequitable and require its amendment. A dismissal of the suit which would have the effect of discarding the present record and rendering fruitless all of the time, effort, and learning devoted to the assembling and presentation of the evidence in the case is clearly not recommendable. If any action were to be taken involving postponement of a final disposition on the merits, it ought to be upon terms which would preserve the present record for future use, supplemented as intervening developments and events might require. My judgment favors: (1) A present decree effecting a water distribution by means of the imposition of a minimum of restriction and by the simplest possible method that will serve present and near future purposes. (2) Retention by the court of jurisdiction to amend the decree if and when it shall be made to appear that important changes of condition have occurred or that any assumption or forecast as to the future upon which the decree was based has by subsequent experience proved erroneous, and that by reason of such changes of condition or errors of prediction equity requires amendment of the decree.

I suggested to the parties the expediency of setting up some kind of a competent and disinterested agency for a continuous study of the many problems with which the case is beset as they may be affected by future conditions and for observation of the operation of such decree as shall be entered, charged with the duty of making periodical factual reports, upon which, if occasion should require, the parties might apply for amendment of the decree. It was suggested that provision for such an agency might, with consent of the parties, be incorporated in the decree. Nebraska favored the proposal; the United States was not opposed; Wyoming and Colorado both expressed opposition on the ground that such an agency might be a cause of irritation and discord among the parties rather than an aid. The proposal without the unanimous consent and approval of the parties is probably impractical, and not to be imposed by the decree.

There is room for difference of view on many aspects of the case, such as the applicability and controlling effect of the principle enunciated in *Wyoming v. Colorado* and as to the "dependable" water supply in view of the habitual wide fluctuations in flow and in view especially of the conditions attending the drouth cycle. For these reasons I shall discuss the possible alternatives to the provisions primarily recommended.

LARAMIE AND SOUTH PLATTE RIVERS.

The South Platte River originates in Colorado and flows into Nebraska, joining the North Platte River at North Platte, Nebraska, forming the Platte River. The water of the South Platte was apportioned between the State of Color-

ado and the State of Wyoming by compact ratified by the legislature of Nebraska in 1923, by the legislature of Colorado in 1925, and by the Congress of the United States in 1926. Copy of the compact may be found appended to the answer and cross-bill of Colorado. Nebraska introduced considerable evidence to show that the compact obtained for her as much water of the South Platte as she was equitably entitled to receive.[1] Since Nebraska's interest in apportionment has been reduced to the question of a supply for the State Line and North Platte Project Canals, all diverting far above the mouth of the South Platte, the nature of the division of water effected by the compact appears immaterial. If material, it is my conclusion that the compact accomplished equitable distribution as between Colorado and Nebraska.

The Laramie River also originates in Colorado, flows into Wyoming and joins the North Platte near Fort Laramie. It was in effect apportioned between Wyoming and Colorado by the decree of this Court in the case of *Wyoming v. Colorado,* 259 U. S. 419. This apportionment I find equitable so far as it touches the interest of any of the parties to this suit.

I anticipate that these conclusions both as to the South Platte and Laramie will be acquiesced in by all parties, and therefore any elaboration as to the basis of the conclusions may be unnecessary. However, the effect upon the position of the Laramie in this suit of the decision in *Wyoming v. Colorado* and the status of the Wheatland Project upon that river, which has been questioned by Nebraska, will be further discussed in Part II, pages 269 to 271, under the caption "Laramie River-Wheatland Project".

[1] N-327-402; R. 1544-1696.

COLORADO APPORTIONMENT.

The evidence relating to Colorado is reviewed generally beginning on page 42, ante. There was found to be presently under irrigation 131,800 acres, consuming (including reservoir evaporation) 98,540 acre feet annually. Exportations from the basin account for an additional 6,000 acre feet, raising the total annual depletion to 104,540 acre feet. Is this within Colorado's equitable share?

Apart from the question of priorities, I find no ground for holding Colorado's present uses to be in excess of her equitable share. Her diversions, it is true, are considerably larger in relation to the land irrigated than those of the sections lower on the river. This is due to differences in irrigation methods required by differences of condition, particularly the shorter period of water supply and of irrigation and growing seasons. The consumptive use rate, on the other hand, is low in comparison with other sections. This is of first importance in view of the fact that return flows develop almost immediately.[1] Total consumption is not large in relation to the quantity of water originating in North Park, only about 16½% of the long-time average. It is not unduly large in relation to production, importance or value. Possibly the same quantity of water would produce greater wealth if applied to land in eastern Wyoming or western Nebraska, but the immateriality of that point was decided in *Wyoming v. Colorado* (259 U. S. 419, 468). Furthermore, reduction in Colorado use would not correspondingly enhance the supply of the other States. In fact there is no clear showing as to the *extent* of benefit to the North Platte Project or other Wyoming

[1] R. 23288, 23310, 23363, 26117-19.

or Nebraska users of any limitation upon present uses in North Park. That determination involves (except as to Pathfinder Reservoir) the time of season when any additional water could be obtained by such limitation and the needs in Wyoming and Nebraska that could be served at that time. It involves transmission losses, reservoir evaporation, changes in weather conditions, and other matters. Present Colorado uses are the basis of an important industry long established and successfully pursued. Any interference with these uses now would no doubt work a serious economic injury to that State. To extend the discussion of Colorado's general equities in respect to present uses is hardly necessary because the only suggestion of limitation upon such uses has been based distinctly upon the rule of priority. Particularly it is claimed that those uses violate the priority of the Pathfinder Reservoir.

Regarding priorities there are the following pertinent facts: The largest irrigation development in North Park occurred in the 40-year period between 1880 and 1920, with but little increase in the last 20 years. Nevertheless, approximately 33 per cent in quantity of the Colorado appropriations are junior to the Pathfinder Reservoir and North Platte Project. A larger percentage is junior to the average seniority of the Wyoming private canals, and a much larger percentage is junior to the Nebraska State Line Canals.

Before a junior can be charged with violating the priority of a lower senior, it must appear that the junior is taking water at a time when the senior is short of an adequate supply and that the closing of the junior would benefit the senior. While it can hardly be doubted that diver-

sions have been commonly made in each section, including North Park, in violation of priorities of seniors in the lower sections, if priorities be assumed to extend across state lines, yet no analysis or study was submitted to show the *extent* of "out of priority" diversions in Colorado or Wyoming above Pathfinder (as was done by Nebraska in respect to the Wyoming diversions below Pathfinder) in relation to priorities and needs of Nebraska users. Therefore there is no definite basis in the evidence for any finding as to the *extent* of any such "out of priority" diversions or the *extent* to which any lower area was injured thereby. As to this, however, Pathfinder Reservoir represents a special situation. Since 1930 this reservoir has never been filled. It has always been in need of water for storage. Its priority is senior to 33 per cent of the priorities in North Park. While the quantity of water diverted or consumed by these junior rights was not separately shown, and may reasonably be supposed to have been proportionately less than by the earlier appropriations, yet these junior rights are represented in the total acreage found to be irrigated and, it must be inferred, account for an important part of the Colorado consumption, probably around 30,000 acre feet a year. Since the Pathfinder is but 180 miles below the Colorado line, it is well within the range of influence of North Park. While 30,000 acre feet would be little more than two per cent of the long-time average annual inflow to Pathfinder for the thirty-seven year period 1904 to 1940, that quantity of water can hardly be regarded as so inconsequential that it should be disregarded for that reason. On a strict application of the doctrine of *Wyoming v. Colorado*, it may be that these Colorado junior diversions would have to be held in violation of the North

Platte Project priority, at least in respect of Pathfinder storage. But the conclusion already stated is that the issue of equitable apportionment in this case is not to be determined solely on the basis of priorities and that priority is to be regarded as but one, albeit an important one, of various factors affecting the equities of the parties. From a consideration of all of the factors bearing on those equities, my judgment is that equitable apportionment does not require any interference with present uses in North Park.

Present uses of Colorado can best be defined in terms of acres irrigated. Neither diversions in second feet or acre feet (of which there are no adequate records or devices for measurement) nor consumptive use would serve the purpose. Acreage irrigated is a reasonably acceptable measure, in view of the relatively minor effect on consumptive use of increased applications of water and in view of the rapidity of the return to the stream of water unconsumed.

There remains the question of further possible irrigation development in North Park and the threat therefrom of violation of the priorities and equities of Wyoming and Nebraska.

It is alleged in Colorado's answer and cross-bill that the State has for many years planned the diversion of other and additional quantities of water from the North Platte River and the use thereof in the State of Colorado; that additional water is available for appropriation in Colorado amounting to not less than 250,000 acre feet per annum; that an additional 100,000 acres of land is susceptible of irrigation in Jackson County; that investigation was made of the physical and economic feasibility of diverting other

water from the North Platte to the Cache La Poudre basin; that some projects were initiated but were defeated by the refusal of the Department of the Interior to grant rights-of-way over public land; that initiated projects requiring 100,000 acre feet per annum should be recognized and apportioned as being senior and superior to the claims of the recently proposed Casper-Alcova Project.

It appears from the evidence that the Biennial Report of the State Engineer of Colorado for 1931 and 1932 estimated that from 50,000 to 180,000 acre feet annually might feasibly be diverted out of the North Platte basin into the Laramie and La Poudre Rivers. The need for additional water in the South Platte basin was said to be "more or less unlimited".[1] On the other hand, there is evidence in the case indicating that physical conditions and available water supply limit the additional land which can be irrigated in North Park to about 30,000 acres. In its brief Colorado says that it is equitably entitled to use consumptively an additional 40,400 acre feet, 25,500 for the irrigation of 30,390 acres of new land in North Park, 8,900 acre feet to cover increased reservoir evaporation, and 6,000 acre feet for further transmountain exportation. This would represent a total increase of 39 per cent over present consumption. The projects comprising the additional 30,390 acres in contemplation were described on pages 44 and 45, ante, where it was observed that they were latent projects representing merely possibilities of the indefinite future.

The position, intention, and claims of Colorado, as defined in her pleadings and brief and as somewhat clarified by the evidence, may, I think, properly be regarded as con-

[1] R. 22908-14.

stituting a threat of further depletion of the river within North Park.

If the water to be distributed be regarded as that represented by the supply available since 1930, then there is none to be apportioned for further irrigation development. The most that can be said for that supply is that by careful conservation and distribution and economical use and the pooling of natural flow and storage water, the supply may be reasonably sufficient to satisfy present requirements. There is no surplus, and therefore any material increase in draft upon the river would necessarily be at the expense of present uses and needs. Diversions to supply any new development would be in violation of established priorities (in their interstate aspect), conspicuously that of the Pathfinder Reservoir. Water taken for any such new development would therefore under present conditions of supply and with any attention to priorities, have to be regarded as beyond Colorado's equitable share.

The more doubtful question is whether the threat is so imminent and serious as to require judicial interference. It can hardly be said to be immediate. It seems very doubtful that Colorado will undertake any expansion of irrigation in North Park under present drouth conditions. Should there be a return to former conditions, additional development might be permissible. On the other hand, new irrigation projects require long-range planning. If any limitation is to be imposed, justice to Colorado would be served by its imposition before the threat becomes imminent to the extent of perfection of plans and investment in preparation and construction. Limitation on further development imposed now would not be subject to the ob-

jection assigned as one of the reasons for denying relief in *Colorado v. Kansas*, where the Court said:

> "On this record there can be no doubt that a decree such as the Master recommends * * * would inflict serious damages on existing agricultural interests in Colorado. * * * It might indeed result in the abandonment of valuable improvements and actual migration from farms."

The limitation now under discussion would have no effect upon existing agricultural or present uses. There would be no present injury whatever. The injury would come, if at all, only when Colorado land owners were prepared to engage in an advantageous extension of irrigation in North Park. To the extent that the threat is lacking in "imminence", the limitation would also be lacking in harmful consequences to Colorado.

Is the threat of additional depletion in North Park of such substantial character as to constitute a threat of serious magnitude? It would seem that the consumption incident to the irrigation of 30,000 to 100,000 acres of additional land in North Park would be sufficiently large, if imposed under any continuation of present conditions, to be regarded as of serious proportions. It would, among other effects, substantially aggravate the encroachment upon the priority of the Pathfinder Reservoir. Increased exportations out of the basin might be considered particularly objectionable. While *Wyoming v. Colorado* (259 U. S. 419, 466) held that diversions by Colorado out of the basin of the Laramie were to be regarded as a legitimate use, since both States permitted like diversions within their own borders, yet from the standpoint of the general

equities there would seem to be some reason for distinction between exportation and uses within the basin. There is, of course, the difference that exportations are wholly lost to the basin while other diversions are but partly consumed and partly returned to the stream. Furthermore, it should be noted that Nebraska law does not permit exportations.[1]

A prohibition against further expansion of irrigation in North Park seems to me recommended by consideration of (a) the insufficiency of the present supply at best to more than satisfy the requirements of presently established uses, (b) the principle laid down in *Colorado v. Wyoming;* (c) the consonance of such limitation with the general plan of apportionment being recommended herein. At the same time to impose a permanently fixed restriction against further irrigation development in North Park would not appear justified in view of the possibility of such future increase in supply as to render it unnecessary. The three alternatives are (1) an outright dismissal as to Colorado, (2) denial of any present relief against that state with retention of jurisdiction to grant such relief on a later showing of such continuation of present conditions of supply as to require the conclusion that they must be accepted as the measure of dependability, (3) imposition of a limitation to present uses of water with retention of jurisdiction to release the restriction if and when the "dry cycle" shall run its course and it appears that the water supply has become such as to justify further expansion of irrigation in North Park. A reasonable argument can be made for any of these three alternatives. My recommendation in line with

[1]Osterman v. Central Nebraska Power & Irrigation District, 131 Neb. 356, 268 N. W. 334.

the third alternative is that Colorado be limited to the irrigation of 135,000 acres, to the accumulation annually of 17,000 acre feet of storage water, and the exportation of 6,000 acre feet per annum to the South Platte basin.[1]

WYOMING APPORTIONMENT

Colorado State Line To Pathfinder Reservoir[2]

This section raises questions very like those discussed in relation to North Park and similar conclusions follow for similar reasons.

About 149,400 acres are irrigated under appropriative rights covering approximately 272,000 acres.[3] Most of the irrigation is from tributaries, the land supplied from the main stream being confined to about 9,400 acres. As in the case of North Park, there are no records of diversions. Three acre feet per acre per season is conceded to be adequate. Land consumption is about one acre foot per acre as compared with .74 of an acre foot per acre in North Park. The rights are mostly small but numerous—Wyoming says "hundreds" on the tributaries. The largest single project is that on Rock Creek, under which 7,800 acres are irrigated. Of the actual diversions, main river and tributaries, probably 65 to 70 per cent in volume are under rights senior to the North Platte Project. Of those from the main river 88 per cent are senior.[4] Both are largely junior to the Nebraska State Line Canals.

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[1]Present capacity of reservoirs is 12,000 acre feet. Appropriations for storage aggregate 17,000 acre feet. The acreage specified allows a safety margin of 3,200 acres.

[2]For preliminary review of the facts relating to this section, see page 47, ante.

[3]C-107; R. 24990-2.

[4]Of the total right acreage of 272,000, about 110,000 acres have rights junior to December 6, 1904. N-9, 368; W-47.

The projects junior to December 6, 1904 have been operated since 1930 in violation of the priority of the Pathfinder Reservoir. In this respect this section differs from North Park, first, in the fact that the appropriations of this section and of the North Platte Project are both under Wyoming law, and, second, the diversions in this section are in closer proximity to Pathfinder. The extent of benefit to Pathfinder which would result from the closing of the various small tributary diversions is problematical. In the aggregate they would probably be substantial in early summer. Such closings would be of questionable benefit to the natural flow rights of the North Platte Project or Nebraska State Line Canals, for the reason that the tributary supplies are usually pretty well exhausted before there is any shortage below Whalen. Also involved would be transportation losses and the flowage time factor. From the head of the section to Whalen is 390 miles; from Pathfinder to Whalen is 210 miles, and to the nearest point of water use in Nebraska is 255 miles.

While the return flows in this section are not so immediate as in North Park because of the greater areas of bench land under irrigation, yet the greater part—undoubtedly more than 75 per cent—occurs during the irrigation season. The time of return is not important to the North Platte Project, since the flows can be captured for use of the project in the Pathfinder Reservoir at any time the reservoir is filled to less than capacity.

Irrigation being mainly on tributaries, they would be chiefly concerned in any regulation or limitation incident to apportionment. To apply to them any rule of apportionment would be a troublesome problem. It would involve dealing with a multitude of small projects diverting

from little streams and furnishing uncertain supplies of various durations all relative short. To subject them to the same limitation in second feet as projects enjoying a longer season would, of course, subject them to lower seasonal limitations and deny them comparable benefits. How could a total reduction for the section be prorated among all these little ditches, so that each would stand its proper share? That any benefit would accrue to senior appropriators below commensurate with the difficulty of applying any limitation on the tributaries or with the hardship that would result to the multitudes of smaller irrigators affected is open to serious doubt. The consumption of water by the lands supplied from the main river under rights junior to the North Platte Project, about 1200 acre feet annually, is a matter of small moment.

My conclusion is that equitable apportionment does not require any limitation upon present uses in this section. The acreage now under irrigation cannot be exactly determined from the evidence, and the figures which have been mentioned rest partly upon estimates. To allow for a reasonable margin of error and for some fluctuations in irrigation, present use may be taken as represented by the irrigation of 153,000 acres. Since water rights in Wyoming attach to the land, this means 153,000 acres within the coverage of perfected rights. By reason of physical limitations and the compensation of return flows, no limitation on diversions need be imposed.

The problem of future development is essentially the same as in North Park. A number of projects are thought to offer possibilities for expansion of irrigation sometime in the future. They are now either uninitiated or dormant. Mention was made of them on pages 50 and 51,

ante. They are all junior to the North Platte Project.

Wyoming's contention is that further development in this section and in North Park is so circumscribed by physical and economic conditions that no limitation by decree is necessary. She suggests, however, that if any limitation be imposed, it should permit the additional irrigation of 17,000 acres in North Park and 51,000 acres in the Wyoming section above Pathfinder. It may very well be that this latitude would be warranted under former conditions of supply. Under present conditions I think no additional burden can be placed on the supply without encroachment on present rightful uses, and therefore propose that present uses as defined should be set as the measure of Wyoming's equitable share in respect to this section. The possible alternatives are the same as those suggested for North Park.

North Platte Project Storage Regulation[1]

The priority of the Pathfinder Reservoir is December 6, 1904, and of the Guernsey April 20, 1923. Between Pathfinder and the Nebraska state line there are on the main river 32 canals diverting under priorities senior to that of Pathfinder. All of the Nebraska State Line Canals are senior. Guernsey is junior to all canals below it down to and including the state line.[2] Under Wyoming law

[1]For the general facts concerning the North Platte Project see pages 30 to 34.

[2]The relationship between the priority of the North Platte Project and other priorities in the several river sections is shown by the following table, which gives the percentage in each section senior and junior to the project:

	Percentage Senior	Percentage Junior
North Park	67	33
Colorado State Line to Pathfinder Reservoir	88	12
Pathfinder Reservoir to Whalen	52	48
Whalen to Nebraska State Line (Wyoming private canals)	91	9
Nebraska State Line Canals	100	0

these reservoirs, in storing water, are obliged to observe the priority of all senior Wyoming canals below them on the main river. While these reservoirs are nominally Wyoming appropriators, the appropriations are in fact more for the benefit of Nebraska than of Wyoming lands. It would be a rather anomalous situation were they to be held to an observance of Wyoming priorities but left free to disregard those of Nebraska appropriators equally affected. Consistency would seem to require uniformity in the relationship between these reservoirs and all senior appropriations participating in the apportionment, whether of Wyoming or of Nebraska. Under the decree proposed this would include the four Nebraska State Line Canals. The plan proposed by the United States, as I understand it, contemplated such observance of priorities either voluntarily or in compliance with a requirement expected to be imposed by the decree. Inclusion in the decree of an express provision covering the matter would probably not be opposed, and would serve to define with certainty the rights and obligations of these reservoirs in relation to senior appropriators down to and including the Canals at the State Line.

Kendrick Project Regulation[1]

This is a Federal project designed to reclaim 66,000 acres of Wyoming land not heretofore irrigated nor under cultivation. It is more than half completed and capable of partial operation, but remains idle for lack of water.

[1]There is a previous reference to this project beginning on page 85, ante.

The three priority dates of the project are: (a) Seminoe Reservoir, December 1, 1931; (b) Casper Canal (natural flow) July 27, 1934; (c) Alcova Reservoir, April 25, 1936. The earliest of these priorities is junior to every other appropriation on the river from Alcova to Tri-State Dam, except a few appropriations of insignificant size between Alcova and Whalen.

Wyoming estimates that not more than 60,000 acres will ever be irrigated under this project, and is willing to have its need for water determined on that basis. There is substantial agreement on the following seasonal requirement factors:

Headgate diversion	2.8 acre feet per acre
Distribution loss	40 per cent
Delivery at land	1.68 acre feet per acre
Consumptive use	1.2 acre feet per acre

At these rates for 60,000 acres the total headgate diversion would be 168,000 acre feet, the consumptive use 72,000 acre feet, and the return flow 96,000 acre feet. Of the latter it is estimated that 46,000 acre feet will return in the May-September period and 50,000 acre feet between October and April.[1] These will be the requirements of the project after it has reached maturity. In its earlier stages of development the requirements will be heavier because of ground absorption and storage. Diversions of three acre feet per acre or more may be needed at first.[2] After the point of stabilization has been reached and there is full development of return flows, the irrigation seasonal depletion by operation of the project will be about 122,000 acre feet, except in so far as the requirement is supplied

[1] U. S.-143; W-171.
[2] R. 24824-8.

out of storage accumulated during the non-irrigation season. The project is expected to operate on storage water mainly. However, without violating the priority of the Pathfinder Reservoir, the project could have stored no water since 1930, and can store none in the future under a continuance of present conditions.[1] The United States plan would postpone Kendrick irrigation until storage in Pathfinder, plus anticipated inflow, equalled 1,000,000 acre feet.

In view of the position taken by Wyoming with respect to Nebraska priorities generally, the assumption seems to follow that, in the absence of compact or decree, there will be no regulation of the Kendrick Project for the benefit of Nebraska senior appropriators. Should the requirement of the project be imposed on the natural flow of the river under present conditions, either by direct diversion or by storage of water during the irrigation season, it would no doubt seriously aggravate the deficiencies of supply such as were experienced by the lower canals since 1930, to the corresponding injury of the appropriators supplied by those canals. To permit the Kendrick Project to operate "out of priority" at the expense of the senior North Platte Project and Nebraska State Line Canals would seem clearly inequitable and in violation of the rule of decision in *Wyoming v. Colorado*.

The proper regulation for the Kendrick Project would be one requiring the observance of priorities, Alcova to Tri-State Dam, both in the storage of water in the Seminoe and Alcova Reservoirs and in the diversion of natural flow by the Casper Canal. The observance of such priorities with respect to Wyoming appropriations is already obli-

[1] R. 29083, 29086.

gatory under Wyoming law. The regulation proposed would merely extend the priority zone to include the Nebraska State Line Canals which are entirely dependent for supply upon water originating above the state line.

The United States suggests that the Kendrick Project should be allowed to operate on storage water when the quantity in storage plus the reasonably *anticipated* reservoir (Pathfinder, Seminoe, and Alcova) inflows exceed the water necessary to satisfy the rights of the North Platte Project and Warren Act contractees. This might be an acceptable suggestion if competent and disinterested judgment could be brought to bear upon what might reasonably be anticipated at any given time. Without such, it seems to me the alternative is the consent of the Wyoming and Nebraska Irrigation Departments on behalf of their interested appropriators. Such consent should be sufficient to authorize the desired operation without special provision therefore in the decree.

The justification for singling out this project for individual treatment is its magnitude and juniority. Being the latest appropration on the river between Pathfinder and the Tri-State Dam, its position, so far as priority is concerned, is one of complete subordination and isolation as distinguished fro, a project occupying an intermediate position between seniors and juniors. Its subordination to the North Platte Project is not only a matter of priority but also a matter of express contract between the United States and the Casper-Alcova Irrigation District. This contract, dated August 3, 1935 (W-3), by its Section 9 provides:

> "It is expressly agreed that the development of the Casper-Alcova Project and the irrigation of lands under it is in no way to impair the water rights of the

> Federal North Platte Reclamation Project in Wyoming and Nebraska, and the said North Platte Project and Warren Act contractors under it are to receive a water supply of the same quantity as would have been received if the Casper-Alcova Project had not been constructed and operated."

It might be suggested that the proposed regulation, having special application to this project, is inconsistent with the view later expressed that the decree may not deal with the rights of individual appropriators not parties. However, the Kendrick is essentially a storage project, although possessed also of a natural flow appropriation. The legal owner of the storage appropriation is the United States or the Secretary of the Interior for the United States. The United States owns and operates the storage facilities and is in physical control of storage water accumulations and releases. It is a party subject to the jurisdiction of the Court, and while injunction may not run against it its rights are subject to determination in so far as may be necessary as the foundation of an injunction against Wyoming. Regulation of the natural flow diversions of the Casper Canal is more questionable from a jurisdictional point of view, but Wyoming has not interposed objection on that ground. Such diversions during the irrigation season would in any event be closely restricted, if not precluded, by the priorities of Wyoming seniors, regardless of the State Line Canals of Nebraska. Presumably a private suit by the State Line Canals against the Kendrick appropriators also would lie, subject to the burden of proof suggested by the decision in *Mitchell Irrigation District v. Whiting*, 136 Pac. (2d) 502;

certiorari denied, 88 S. C. (L. Ed.) 840. And see cases cited in footnote 1, page 113.

The foregoing discussion has reference to conditions since 1930. Water supply for this project under pre-1930 conditions, should they occur again, might permit full operation within its own priority. During the period from and including the years 1914 to 1930, the Pathfinder Reservoir "spilled" in 12 different years.[1] In those years the quantity of water available and subject to storage exceeded the capacity of the reservoir. The "spills" were unmeasured. According to a study submitted by Nebraska[2] of a hypothetical joint operation of Pathfinder, Seminoe, and Alcova Reservoirs during the 37 years 1904 to 1940 under present conditions of irrigation, including a Kendrick demand for 25,000 acres (partial development), there would have been spills in eight years between 1918 and 1930 aggregating 2,341,000 acre feet, or an average of 180,077 acre feet for the 13-year period.

A Wyoming study came to the conclusion that had the three reservoirs been in operation during the 45-year period 1895 to 1939, under present conditions of irrigation development there would have been conserved and available at Pathfinder an average of 200,000 acre feet annually above that which was available under operation of the Pathfinder alone. Allowing for additional evaporation loss of 40,000 acre feet a year, there would remain a net increase in available water of 160,000 acre feet annually.[3] Since the diversion requirement for 60,000 acres at the 2.8 rate would be 168,000 acre feet, the additional conservation

[1] W-113. In the highest water year since 1930 the reservoir filled only to 80 per cent of capacity, and in 1934 filled to only 81 per cent of capacity.
[2] N-617.
[3] W-107, 108; R. 19710-18, 19864-8.

of water would fall 8,000 acre feet per year below the full diversion requirement of the Kendrick Project. This is assuming that any direct flow available to the Casper Canal during the irrigation season would be negligible, as is probable if operated on a priority basis. The total consumption at the 1.2 rate would be 72,000 acre feet annually, the deduction of which from the 160,000 acre feet of additional water would leave a net gain of 88,000 acre feet per annum as the result of the entire operation of the Casper-Alcova Project.

The evidence is convincing that given 1895-1939 average conditions of supply, water can be conserved by Seminoe and Alcova Reservoirs, without violation of priorities between Pathfinder and Tri-State Dam, sufficient substantially to supply the Kendrick Project and leave a considerable return flow (the time and extent of which can only be roughly estimated) to the river in irrigation season, which would represent net seasonal gain to the river below Alcova. Again the question is when will the conditions of 1895 to 1930, or anything comparable to them, be next experienced.

There will be some further discussion of water losses under this project in Part II, page 267, under the caption "Water Losses under Kendrick Project," followed by a discussion of a legal issue respecting the disposition of Kendrick return flows.

Joint Operation of North Platte and Kendrick Storage Facilities

By the United States it was argued that it would be within the authority of the Secretary of the Interior to

operate the reservoirs of the North Platte and Kendrick Projects as a unit and to permit Seminoe to borrow from Pathfinder when in need of water, and vice versa. It was at least suggested that this plan might be put into effect. An analysis of water resources by a Government engineer was introduced, in which joint operation was assumed,[1] although said not to be inherent in the Government plan.[2] The effect of the borrowing by Seminoe from Pathfinder would be, or at least might be, to give Seminoe the benefit of the Pathfinder priority, for though it be intended to recognize the separate *rights* of the reservoirs by bookkeeping and repayment of water loans, yet the ability to repay when water is needed by the creditor would always be conjectural. Borrowing by Pathfinder from Seminoe might be equally prejudicial to the latter. Furthermore, it is difficult to see how the practice of borrowing can be carried on without involving the United States in violations of its North Platte Project and Warren Act contracts with the land owners, now represented by irrigation districts. Counsel for the Government concede, according to my understanding, that there can be no joint reservoir operation without adjustment of these contracts. While there would be certain obvious advantages in joint operation and borrowing, that practice, as matters stand, appears infeasible and would be violative both of priorities and of the storage rights created by the Government contracts. These reservoirs should therefore be operated in accordance with their own relative priorities as well as in accordance with the natural flow priorities downstream. There should be, however, permission fof the impounding in Seminoe Res-

[1] U. S.-271 and 273.
[2] R. 29082-6, 29094-29104. A general plan of reservoir operation is outlined in U. S.-266.

ervoir "out of priority" water for such use only in the generation of power by the Seminoe Hydroelectric Power Plant as will not materially interfere with the administration of the water for irrigation purposes according to priority.

Counsel for the United States suggested that provision be made in the decree for joint operation in the event of such adjustment of the storage contracts as to remove objection from that source. Such adjustment, however, might not clear the way for joint operation, for there would remain the question of rights under Wyoming natural flow appropriations senior to Seminoe but junior to Pathfinder.

The conflict between joint operation as proposed and the storage contracts is more fully discussed in Part II beginning on page 181.

Pathfinder-Whalen Apportionment.[1]

Only the diversions from the main river require consideration. As already seen, the run-off of the tributaries becomes so far exhausted before any shortage of water occurs in the main river that any regulation of the tributary diversions would be of no material benefit to anyone. On the argument it was suggested that any increase of storage on the tributaries might reduce the outflow now available for storage in the off-channel reservoirs of the Interstate Canal, and should for that reason be restricted. However, there is no showing as to what contribution, if any, these tributaries now make to the supply of the reservoirs or

[1]For a preliminary statement of facts, see page 51, ante. For map of section showing diversions and canals see N-110. The testimony concerning the section is found mainly between pages 16220 and 16725 of record; see W-116 for list of Wyoming rights.

what additional storage projects may be feasible on the tributaries or what the effect of their construction and use might be on the supply otherwise available for the reservoirs. There is insufficient basis for finding any threat from this source requiring attention in the decree.

The headgate requirement of the sixty main river canals (97 rights) supplying 14,000 acres is 35,000 acre feet per season, which, if fully supplied, would involve a seasonal depletion after credit for return flows of about 19,500 acre feet. About 48 per cent of the rights in this section are senior to the North Platte Project, but all, except one small ditch, are junior to the Tri-State Canal and most of them are junior to the other Nebraska state line canals. This section adjoins the critical Whalen - Tri-State Dam section. Equitably it should share the shortages as well as the abundances of the latter section. That there are natural physical limitations on diversions which operate in time of low water is apparent from the fact that during the 1931-1940 period the average seasonal diversion rate for the section was but two acre feet per acre as compared with a requirement of 2.5 acre feet.[1] Only 80 per cent of the requirement was satisfied despite the fact that the accretions to the river in this section greatly exceeded the depletion. In low stages of flow some of the ditches are unable to divert any water.[2]

According to Nebraska's "out of priority" study, the diversions in this section made in violation of the priorities of the Nebraska State Line Canals during the years 1931 to 1936 totaled 54,167 acre feet, and therefore averaged 9,028 acre feet per year. Probably nor more than 60 per

[1] R. 26467, 27897.
[2] R. 27898.

cent, or 5,400 acre feet per year, represents depletion during the irrigation season. In other words, assuming full validity for the Nebraska out of priority claim, 5,400 acre feet would represent the maximum seasonal average consumption out of priority in relation to the State Line Canals. There may also be some violation of the natural flow priorities of the North Platte Project canals, but there is no analysis of any such and it is improbable that they were very substantial, in view of the fact that more than 50 per cent of the priorities in the section are senior to that of the project.

Wyoming is willing to submit to a limitation on diversions from the main river of 40,000 acre feet per season. This would be 5,000 acre feet, more than enough to provide 2.5 acre feet per acre for the land now in irrigation. It would allow full supply for the irrigation of an additional 2,000 acres. There is no evidence as to any further irrigation possibilities in the section or of any projects in contemplation. Physical conditions are unfavorable to further development. The narrowness of the valley and the heavy cost of constructing gravity ditches capable of conducting water beyond narrow strips of land adjacent to the river are prohibitive obstacles to any large irrigation expansion.

Under all the conditions, imposition of any specific limitation on diversions for use upon lands now under irrigation appears unwarranted. To put under regulation for the benefit of the State Line Canals all the little diversions from Pathfinder to Guernsey, ranging in size from 10 acres up, would seem to involve a burden and effort rather disproportionate to any realizable result. If any limitation is to be imposed, it can well follow the pattern of that suggested for the two sections above. Let Wyoming be lim-

ited in this section to the irrigation from the main river of 15,000 acres.[1] Natural conditions can probably be depended on to preclude any use of water greatly in excess of the section's equitable share for that acreage.

Whalen-Tri-State Dam Apportionment.

All parties recognize that this section presents a special situation calling for special consideration and treatment. The facts have been heretofore reviewed.[2] In summary, the exceptional features are (1) the great concentration of demand in a short compact section, (2) the presence of water, both natural flow and storage, to which Nebraska users are entitled under Wyoming appropriations, (3) the total dependence of Nebraska State Line Canals and the North Platte project canals upon water originating in Wyoming and Colorado, (4) the joint use of canals to serve both Wyoming and Nebraska lands, (5) the location in Wyoming of the head gates and works which divert great volumes of water for Nebraska, (6) the distinctly interstate scope and character of the water distribution without any real interstate administration.

These extraordinary features of the section tend to support the proposal by Nebraska, Colorado, and the United States, that the section be treated as an administrative unit without regard to the State Line. Nebraska and the United States urge administration of natural flow according to a single priority schedule and delivery of storage water ac-

[1] The estimate of 14,000 acres as representing the extent of present irrigation is only approximate. Wyoming claims 14,777 acres, Nebraska concedes 13,420 acres (N-621). Placing the limitation at 15,000 acres, allows for a substantial margin of error as well as for some fluctuation.
[2] Pages 53 to 92.

cording to the government contracts. Colorado says this method of distribution might well be used and in any event that there should be distribution of natural flow in accordance with "relative rights" regardless of the State Line and of storage water according to contract. Wyoming would include the section in a general scheme of mass allocation of both natural flow and storage water extending from Pathfinder to the Tri-State Dam.

The imposition of an interstate priority schedule for this short section would not be open to all of the objections which preclude the adoption of such a schedule throughout the length of the river. Objections based on physical infeasibility and diversity of conditions are largely inapplicable. Objections remaining are: (1) It would deprive each State of full freedom of intrastate administration of her share of the water. (2) It would indirectly fix a limitation upon each individual appropriator in the section by a determination of beneficial use and would fix a further limitation upon each group or district by establishing a diversion limitation on the canal supplying the group or district and would determine the position and rights of appropriators in relation to each other. This would be a very different matter from a determination of each state's equitable share. Whether the establishment of such a priority schedule in an interstate suit with the incidents mentioned would be consistent with due process of law in the absence as parties of the individual appropriators and districts affected would appear to be open to serious question. (3) It would burden the decree with administrative detail beyond what may be necessary to equitable apportionment between the states.

Apportionment by mass allocation is open to the objections already discussed, namely its rigidity and the impossibility, in the face of the constant wide and unpredictable fluctuations in supply and of the present long continued period of abnormally low supplies, to arrive at a rational "dependable" flow.[1] Any assumption as to dependability would be bound to result in injustice to one state or the other. A further objection to the proposal advanced by Wyoming is that it apportions not only natural flow but also storage water the disposition of which is controlled by contracts and which is therefore not subject to apportionment. Mass allocation for the section of natural flow only would encounter difficulty arising from a lack of complete evidence as to the volume of natural flow in the section available for distribution when segregated from storage water.[2]

A method of apportionment that would avoid these objections to the interstate priority and mass allocation methods is that of distribution of natural flow on a percentage of daily flow basis. To illustrate: The land supplied from the section lies 27 per cent in Wyoming and 73 per cent in Nebraska. Assuming for the illustration that land area would be the proper basis of apportionment, 27 per cent of the daily flow would be allotted to Wyoming and 73 per cent to Nebraska. The quantities would vary from day to day, but the proportions would remain constant. Under this method each State would participate proportionately and immediately in all variations in supply. The share of each State, determined by the established ratio, would be subject to administration by that State in any manner it saw fit or the rights of its appropriators might require.

[1] See graph, page 25.
[2] See on this subject pages 69, ante.

The first question about such basis of allocation is whether it is of a nature suitable for inclusion in an interstate apportionment decree. It is without precedent in the previous decisions of this Court. In *Colorado v. Kansas*, Kansas asked for an allocation to her of a portion of the waters of the Arkansas River in terms of second feet. The special master recommended apportionment in percentages of acre feet. In this the master was held to have erred. However, Kansas was denied all relief, leaving in doubt whether the court intended to rule that the *method* of apportionment recommended by the master would have been necessarily wrong even had Kansas shown herself entitled to *some* relief. In other words the uncertainty is whether the court meant to indicate a general disapproval of apportionment by the percentage or proportion method in respect to all interstate water suits regardless of factual distinctions. If the language of the opinion is to be understood as having that broad implication, it would, of course, rule out any proposal of the nature outlined above.

The facts of *Kansas v. Colorado* were radically different from those of the present case and this is particularly true regarding the section now under study. It may be that the special facts of this case and of this particular river section and the lack of any satisfactory alternative will be considered sufficient warrant for the limited application proposed of this method of equitable distribution. I shall therefore work out an allocation for the section on the percentage of flow method so that the result may be seen and then will consider the possible alternatives.

Depending on the factor employed such allocation may take the form of: (1) A division proportioned to the total acreages of the states irrigated by water supplied from

the section. This would ignore priorities and differences in the diversion requirements. (2) A division proportioned to the total diversion requirements of the lands in the two states. This would still ignore priorities. (3)A division on a strict priority basis. This would require a segregation of the canals into 13 groups according to priorities as shown in Table XVII, page 86. If the division were to be made on the acreage or requirement basis, there might be reason for a subdivision of canals or appropriations so as to place all having priorities earlier than the North Platte Project, December 6, 1904, in a senior group and those having priorities of December 6, 1904, or later in a junior group. The percentages of flow which would go to each of the states under a division according to total acreage and total requirement and also according to the acreage and requirements of the senior and junior subdivisions would be as follows:

	Wyoming	*Nebraska*
Total Acreage	27%	73%
Total Requirement in Acre feet	23%	77%
Total Senior Acreage	24%	76%
Total Junior Acreage	28%	72%
Total Acre feet Requirement, Senior Acreage	22%	78%
Total Acre feet Requirement, Junior Acreage	23%	77%

How the results of division on these bases would compare with a distribution on a priority basis may be seen from the following Tabulation (XIX) in which an assumed river flow is separated into segments according to priority groups. This grouping corresponds with the priority groups shown in Table XVII, page 86, except that groups 8, 9, 10, 11, 12, and 13 appearing in Table XVII are combined in group 8 of

the present table. All water values are expressed in second feet. Column one designates each segment of flow. Column two shows how each such segment would be allocated between the two states on a priority basis, that is on the assumption that each canal is diverting, in order of priority, the maximum limit of one second foot for each 70 acres. Column three gives the percentages by states of the cumulative totals of Column one. Column four shows what each state would receive of each segment on an acreage basis, that is on a division proportioned to the total acreages in the states, cumulative totals also being shown. Column five makes the same analysis in respect to a division on a requirement or acre feet basis.

TABLE XIX

CONCERNING APPORTIONMENT OF FLOW, WHALEN - TRI-STATE DAM SECTION

1 Flow	2 Priority Basis		3 Percentages		4 Acreage Basis		5 Acre Feet Basis	
					24% - 76%		22% - 78%	
	Wyo.	Neb.	Wyo.	Neb.	Wyo.	Neb.	Wyo.	Neb.
1. Up to 103 second feet	103	0	100	0	24	79	23	80
2. 103 to 1027 (924)	0	924			222	702	203	721
Cumulative Totals	103	924	10	90	246	781	226	801
3. 1027 to 1121 (94)	94	0			23	71	21	73
Cumulative Totals	197	924	18	82	269	852	247	874
4. 1121 to 1328 (207)	0	207			50	157	46	161
Cumulative Totals	197	1131	15	85	319	1009	293	1035
5. 1328 to 1494 (166)	166	0			40	126	37	129
Cumulative Totals	363	1131	24	76	359	1135	330	1164
6. 1494 to 1513 (19)	0	19			5	14	4	15
Cumulative Totals	363	1150	24	76	364	1149	334	1179
7. 1513 to 1526 (13)	13	0			3	10	3	10
Cumulative Totals	376	1150	25	75	367	1159	337	1189
					28% - 72%		23% - 77%	
8. 1526 to 4382 (2858)	801	2057	28	72	690	2168	629	2229
Grand Totals	1177	3207	27	73	1057	3327	966	3418
	4384				4384		4384	
					27% - 73%		23% - 73%	
1 to 8 inclusive	1177	3207	27	73	1184	3200	1008	3376

From the foregoing it will be seen that it would make no vital difference which of the three bases of division might be adopted *except as to the first 1,500 second feet.*[1] The maximum difference as to other water would be 6%. Also it may be noted that of the lands remaining unsatisfied after distribution of the first 1,500 second feet on a priority basis, 97% are under the North Platte Project. All of the project lands carry the same priority and have comparable storage rights. They are in complete parity with each other and apportionment among them presents no difficulty. An allocation of the first 1,500 feet among the groups 1 to 5 is a more difficult problem. Nearly 50% of the requirement of these groups is represented by the Nebraska Tri-State Canal and more than 60% by the Tri-State and Mitchell Canals. The combined requirement of the two is 924 second feet. Under a priority administration whenever the flow would fall below 1,027 second feet, there would be no water for the Wyoming canals in groups 3, 5, and 7 except such storage water as would be available to the Lingle and Hill Districts (in group 5) under their Warren Act Contracts. The natural flow not uncommonly falls below this volume at the most critical time of the growing season. While the Wyoming appropriations in these groups are junior to Tri-State and Mitchell, they represent old established uses in existence for 40 to more than 50 years enjoying a supply of water not challenged by Nebraska on behalf of the Tri-State or Mitchell until the present drouth cycle. To place them now in complete subordination to these Nebraska canals on the priority theory would appear at least questionable from the standpoint of equity.

[1] In a receding river this would be the last 1,500 second feet.

There are certain other factors which may bear upon the equities in relation to this situation. First there is the matter of storage water. For the lands included in groups 1 to 4, 82% of the Nebraska acreage has storage water rights under Warren Act Contracts while but 7% of the Wyoming lands have such rights. Including groups 1 to 7, 82% of the Nebraska lands and 47% of the Wyoming lands have Warren Act Contracts. Of the Nebraska canals in the 7 groups only the Mitchell and Ramshorn are without storage rights.

On behalf of the Warren Act contractees it is urged by Nebraska that these contracts represent special investments in storage water which serve as a kind of insurance against failure of natural flow, and that the holders of such contracts are justly entitled to the full benefit of their investments without impairment of their natural flow rights. Considered solely on the basis of legal right and of intrastate administration this argument is unanswerable, but in an equitable distribution of natural flow between States, where the ultimate question is the State's share, and the rights of individual appropriators are taken into account only for their bearing on the larger right of the State, storage water available to the appropriators of each State may be considered in determining the State's equitable share of the natural flow. This appears to be the clear holding of *Wyoming v. Colorado*, 259 U. S. 419 (480, 484-486).

Nebraska also calls attention to the special relationship between the Tri-State and Mitchell Canals. The Tri-State with its requirement of 748 second feet has the earliest priority of the State Line Canals. It has a Warren Act Contract. The Mitchell Canal heading above the Tri-State has no storage right and has but a subordinate claim to

natural flow. Nebraska says that to reduce her share of natural flow because of the storage right of the Tri-State would in effect penalize the junior Mitchell District dependent entirely on natural flow. That, however, is a problem of internal administration in Nebraska and the decree can not well take into account such individual situations. It cannot earmark water for individual canals or adjust the rights of canals as between each other unless by adoption of an outright interstate priority schedule. It may further be said that the Mitchell Canal's position of disadvantage in relation to the Tri-State already exists. Any allocation between the states would represent a limitation on Wyoming not heretofore in operation and would to that extent ease any problem relating to the State Line Canals. It might also be observed that increasing Nebraska's total share would not necessarily mean that the Mitchell rather than the Tri-State would be the beneficiary. Any increase would go to the Mitchell only after the Tri-State's requirement of natural flow water was completely satisfied and while the Mitchell's requirement was in course of being satisfied.

Wyoming urges very earnestly, as an equitable circumstance against the allowance of the natural flow claimed by Nebraska on account of the Tri-State, that at the time the Warren Act contract was entered into by the predecessor of the present Farmers Irrigation District the dependable natural flow available to the Tri-State Canal was but 80,000 acre-feet per annum,[1] which, at three acre feet per acre, would permit the irrigation of but 27,000 acres;[2] that only by virtue of the storage water received under its Warren Act contract from Pathfinder Reservoir (with the later priority

[1] N-493; R. 21246-21252.
[2] At 3.5 a. f. a. the acreage supplied would be 22,850.

of December 6, 1904) was it possible to develop and supply the present area of over 50,000 acres, and that therefore a demand now made upon natural flow to supply this acreage cannot equitably be recognized in reduction of the natural flow otherwise available to canals junior to Tri-State which are without storage water. The factual premise upon which this argument is founded is well supported by the evidence, but it can be said also that the supply for the Wyoming private canals in the section too has been enhanced through the operation of the Pathfinder and the return flows resulting from use of storage water. The most that can be said is that the benefit to Nebraska from this source has been relatively greater than to Wyoming.

Another factor favoring Nebraska is that there will commonly be accidental water in substantial quantities passing the state line above that allocated to the State. Even during the dry cycle and with no restriction on Wyoming uses, the usable water passing Tri-State Dam averaged in the May-September period 81,700 acre feet.[1] More than half of this flow, however, occurred in May and June with comparatively little in August and September. The quantity is perhaps too uncertain to be considered of great importance. It is a minor factor in the balancing of equities between the States.

CONCLUSION AS TO WHALEN-TRI-STATE DAM SECTION—AND COMMENTS.

My conclusion is to recommend a straight line apportionment of 25% to Wyoming and 75% to Nebraska of all natural flow in the section between May 1 and September 30 of each year.

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[1] W-180.

As compared with a strict priority administration, this method of apportionment at certain stages of the river would operate to the advantage of Nebraska and at the other stages to the advantage of Wyoming. On the first 412 second feet of flow the advantage would be to Nebraska, 412 being the point at which 25% of the flow would first equal the 103 second feet Wyoming would receive on a priority basis. On the next 1,114 second feet the advantage would be to Wyoming since it would be only after the total flow had reached 1,526 second feet that Wyoming's share on a priority basis would equal 25% of the flow. On the last 2,858 second feet Wyoming's 25% would compare with 28% it would receive on a priority basis and 23% on a land requirement basis. In furtherance of the right of each state to administer its own share Nebraska should have the right to designate what portion of its 75% share is to be delivered into the Interstate, Ft. Laramie, French, and Mitchell Canals for use on the Nebraska lands served by these canals.

Should the suggested division of flow be thought to give insufficient weight to the priority factor, the remedy would be to further subdivide the flow with provision for additional ratios, for example:

	Wyoming %	Nebraska %
Flows up to 103 second feet.....	100	0
Flows from 103 second feet to 1,027 second feet	0	100
Flows from 1,027 second feet to 1,526 second feet	55	45
Flows over 1,526 second feet	28	72

This process could be carried out to the extent of giving effect to each individual priority in the section. The principal difference between such a detail schedule and a com-

plete priority schedule would be that under the former the total water awarded to each state could be administered by that state in any manner it saw fit while under the latter the distribution to each individual canal would be prescribed.

Should the conclusion be to establish a complete interstate priority schedule for the section, all necessary information for the purpose will be found in summary form in Table XVII, page 86.

This apportionment assumes that the distribution of storage water is controlled by the various storage contracts and that such water would be delivered in accordance with the terms of those contracts. In that connection the following question arises: All of the storage water contracts (Project and Warren Act) limit the total water, natural flow and storage, which the holder of any contract may demand, to that for which his land has beneficial use. In arriving at the equitable share of each State I have first determined for that purpose the *requirements* of the various canals or districts. Is this to be taken as a determination of the limits of beneficial use for the purpose of intra-state administration? If so, those limits would apply to both storage and natural flow water.

Wyoming feels that such a limitation should be placed on the Nebraska State Line Canals for its effect upon the conservation of storage water. From a practical standpoint, and perhaps from an equitable standpoint, this might be a proper and desirable measure. From a legal standpoint, I doubt the jurisdiction of this Court to fix such limitations upon individual canals. The suit is between States and jurisdiction is invoked to determine the equitable rights of the States, that is, to determine the proper apportionment

of water between them. The requirements of individual appropriators in each State being one of the elements in the ascertainment of the State's equitable share, they are incidentally a proper matter for investigation and determination for their bearing on the ultimate issue. But it would be quite a different matter to undertake to define the rights of individual appropriators between each other or between them and their State, or to determine what portion of the State's share must be allocated to any appropriator or group of appropriators, or to place a limit upon the participation of any appropriator or group in such allocation. That, in the absence of the appropriators as parties, would, I apprehend, as to them amount to a denial of due process of law. Consequently, the findings herein as to *requirements* cannot, I think, be deemed a limitation upon individual canals or groups, in actual administration, either as to natural flow or storage water, nor do I think any such limitations can properly be imposed by the decree.

From the standpoint of practical operation there should be no exceptional difficulty in a division of the water in the section on a proportion of flow basis. Such distribution, of course, would have to be employed only in time of water shortage which probably would not average to exceed three months each year. A segregation at Whalen of natural flow and storage water would have to be effected during the time the plan were in operation. Determination would have to be made of the accretions between Whalen and the state line. This would involve merely a proper computation based upon the natural flow discharges at Guernsey, the diversions between Guernsey and Tri-State Dam, transportation losses and flows at the state line. All of these elements are common to water administration and would for

the most part have to be taken into account in any scheme of allocation. Adequate measuring devices are, as I understand the facts, already in use for the measurement of diversions. There is also a gauging station at the state line. It may be that this station would not be adequate for the automatic recording of the state line flows under the proposed plan of apportionment. If not, a station adequate for the purpose with suitable measuring devices should be installed and maintained at the joint expense of Wyoming and Nebraska at the state line or as near the line as may be necessary and practical for the recording of flows passing from Wyoming into Nebraska.

Alternatives.

What are the possible alternatives to an apportionment for this section on a proportion of flow plan? The several proposals of the parties have heretofore been discussed. If the plan for division of the daily flow be considered objectionable as being inconsistent with a proper use of the judicial process or as involving "judicial imposition of a hard and fast rule" in substitution for expert administration,[1] the interstate priority schedule proposed by Nebraska, Colorado, and the United States would appear to be even more seriously subject to that objection.

The only suggestion of mass allocation for the section has come from Wyoming, a suggestion which assumed the propriety of treating natural flow and storage water as a common fund. There has been no engineering analysis directed to the question of what might be a proper mass allocation of natural flow segregated from storage. In fact the evidence

[1]Colorado v. Kansas, 320 U. S. 383, 392.

as to what is the natural flow fund in the section is not definite and complete. Furthermore Wyoming, the only proponent of mass allocation, has indicated strong objection to any apportionment limited to natural flow.

A comparison of the diversions with the requirements as found, might suggest that a simple limitation to actual requirements upon the total Wyoming uses in the section would yield considerable additional water for the Nebraska State Line Canals. The total Wyoming requirement is 227,000 acre feet per season. But 80 per cent of the Wyoming lands in the section have storage rights and are largely supplied with storage water. The diversions of natural flow have probably never approached 227,000 acre feet per season. Hence the suggested limitation would be wholly ineffectual. What would be a reasonable limitation upon Wyoming diversions of natural flow water only cannot well be determined from the evidence. A limitation to actual requirements would operate with effect if applied with respect to the nine Wyoming private canals diverting between the Whalen Dam and the state line. With the exception of 954 acres, these lands are without storage rights. The seasonal requirement of the nine canals is 43,000 acre feet, exclusive of the Nebraska land under the French Canal. These canals have consistently exceeded their determined requirements, and have therefore at least to that extent exceeded their equitable shares.[1] The excess has run as high as 24,463 acre feet in a season, but the average excess for the ten years 1931-1940 was but 10,120 acre feet. The average seasonal diversion was 122 per cent of the requirement. It is possible that some of the water going to make up the ex-

[1]See Table IX, Page 77.

cess was diverted during periods of ample water when there was no resulting injury to the seniors below. A seasonal limitation upon Wyoming to the diversion of 43,000 acre feet of natural flow between the Whalen Dam and the Wyoming-Nebraska state line would appear entirely equitable. However, such a provision would be dealing with only about five per cent of the total water supply in the section, a relatively small factor in relation to the section or state as a whole. If these canals were to be singled out as the basis of a special limitation on Wyoming, the amount of the allowance for them should not in my opinion be reduced below their actual needs on the theory that the supply in the section is insufficient to satisfy the requirements of all. Any limitation below requirements would be justified only in some general sceme of apportionment for the section.

Through process of elimination by one consideration or another, the possibilities of a general apportionment for this section appear virtually reduced to a division of daily flow as proposed *or* a complete sectional priority schedule. Beyond these I see little choice but to leave the section unapportioned and confine the decree to such regulation of the North Platte Project storage and the Kendrick Project as will insure their operation on a proper priority basis and to the imposition of such limitation, if any, as may be deemed equitable upon further expansion of irrigation in Colorado and in Wyoming above Guernsey.

THE POSITION OF THE UNITED STATES AS OWNER OR APPROPRIATOR.

The United States claims an interest in this suit on two distinct theories: *First,* that it is the *owner*[1] of all unappropriated water of the river system and has made a *reservation* of the water needed for the North Platte and Kendrick Projects; *second,* that it is an *appropriator* under the laws of Wyoming and Nebraska of water for these projects. Consistently with the appropriation theory, the United States asks that in any equitable apportionment the decree allocate to it, rather than to Wyoming or Nebraska, the water to which the North Platte Project and Kendrick lands are entitled. These claims of the United States must be examined historically.

By cessions from France, Spain, and Mexico in 1803, 1819, and 1848, and agreement with Texas in 1850, the United States became sovereign over and proprietor of a large territory, including the land now embraced in the States of Nebraska, Wyoming, and Colorado. There was then no private ownership of land or rights in water in the North Platte Valley. The United States became the owner of such rights in the waters as were subject to ownership. It would be a natural assumption that until some other system of acquisition and ownership was set up, the common-law doctrine of riparian rights would obtain. However, it has been suggested that in the arid country of the West that doctrine was so inherently unsuited to the needs and conditions of the country that it cannot be assumed ever to have been recognized or adopted there; that the earliest settlers, by custom and local law,

[1] "Ownership" as used in this connection actually denotes possession of a prior right of use, since, correctly speaking, there may be no ownership of the corpus of water in a running stream.

adopted from the first the principle of priority of appropriation, and that the priority doctrine in fact became the common law of that country (*Restatement of Torts*, Sec. 849, p. 340). Until the days of the California gold rush there was no question as to the nature of water rights. There was no one to challenge any right the national Government might conceive itself possessed of. It was only after the occupancy of the public lands by prospectors and miners in great numbers and their appropriation and use of water for mining and other purposes, under improvised local rules, usage, and laws, that any issue as to the nature of water rights became a matter of importance and a subject of consideration by the Congress. This development and its relation to the Act of July 26, 1866 (14 Stat. 251) are recited at length in the opinion in *Jennison v. Kirk*, 98 U. S. 453. That Act provided that whenever by priority of possession rights to the use of water for mining, agricultural, manufacturing, or other purposes had accrued and vested under local customs, laws, and decisions of the Courts, such rights should be maintained and protected. An amendment of July 9, 1870 (16 Stat. 217) subordinated all patent and homestead rights to rights acquired under or recognized by the Act of 1866. These Acts were held to operate prospectively as well as in respect of rights antecedent in origin. They gave congressional recognition to priority of appropriation as a method of acquiring water rights in the territory. They were followed in turn by the Desert Land Act of 1877 (19 Stat. 377), which extended the right of appropriation to any declarant of intention to reclaim a tract of desert land, and provided that:

"All surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers, and other sources of water supply upon the public land and not navigable, shall remain and be free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, subject to existing rights." (43 U. S. C. A., Sec. 321).

This Act applied originally to Wyoming, later to Colorado, but never to Nebraska. There are many decisions on the purpose and effect of the Act. Among the more recent are *California-Oregon Power Co. v. Beaver Portland Cement Co.*, 295 U. S. 142, in which the Court said of the Desert Land Act:

"If this language is to be given its natural meaning, and we see no reason why it should not, it effected a severance of all water upon the public domain, not theretofore appropriated, from the land itself * * *.

"As the owner of the public domain, the government possessed the power to dispose of land and water thereon together or to dispose of them separately. * * * The fair construction of the provision now under review is that Congress intended to establish the rule that for the future the land should be patented separately; and that all non-navigable waters thereon should be reserved for the use of the public under the laws of the states and territories named * * *. If it be conceded that in the absence of federal legislation the state would be powerless to affect the riparian rights of the United States, or its grantees, still, the authority of Congress to vest such power in the state, and that it has done so by the legislation to which we have referred, cannot be doubted. * * *.

"Nothing we have said is meant to suggest that the Act, as we construe it, has the effect of curtailing the power of the states affected to legislate in respect of

water and water rights as they deem wise in the public interest. What we hold is that following the Act of 1877, if not before, all non-navigable waters then a part of the public domain became *publici juris*, subject to the plenary control of the designated states, including those since created out of the territories named, with the right in each to determine for itself to what extent the rule of appropriation or the common law rule in respect of riparian rights should obtain. * * * The Desert Land Act does not bind or purport to bind the states to any policy. It simply recognizes and gives sanction, in so far as the *United States* and its future grantees are concerned, to the state and local doctrine of appropriation, and seeks to remove what otherwise might be an impediment to its full and successful operation."

This opinion declares in effect that by the Desert Land Act the Congress subordinated any previously existing right of the Government in the waters of the public domain to which the Act applied, to appropriation and use under and according to the laws and subject to the plenary control of the states and territories, yielding to them the right to prescribe either the riparian rule or rule of appropriation.

In the case of *Brush v. Commissioner*, 300 U. S. 352, the Court said:

"Many years ago, Congress * * * passed the Desert Land Act, * * * by which, among other things, the waters upon the public domain in the arid-land states and territories were dedicated to the use of the public for irrigation and other purposes. Following this Act, if not before, all non-navigable waters then owned and belonging to that part of the national domain become *publici juris*, subject to the plenary control of

the arid-land states and territories with the right to determine to what extent the rule of appropriation or the common law rule in respect of riparian rights should obtain."

In *Ickes v. Fox*, 300 U. S. 82, the Court again said:

> "The federal government, as owner of the public domain, had the power to dispose of the land and water composing it together or separately; and by the Desert Land Act of 1877, * * * if not before, Congress had severed the land and water constituting the public domain and established the rule that for the future the lands should be patented separately. Acquisition of the government title to a parcel of land was not to carry with it a water right; but all non-navigable 'waters were reserved for the use of the public 'under the laws of the various arid-land states'."

In the *Brush* case Mr. Justice Sutherland characterizes the operation of the Desert Land Act as a "dedication". Whether the effect of the Act was a "dedication", a "grant", a "waiver", a "subordination", or something else, it is clear that under the Act, as construed, the non-navigable waters of the public domain (within the territorial scope of the Act) were set free for private appropriation and to the states and territories was entrusted the responsibility of setting up laws and rules governing appropriations and perhaps the discretion of substituting the riparian system. Although the Congress undoubtedly has had the power to repeal or amend the Act of 1877 so as to withdraw any right of further appropriation of the waters of the public domain, the fact remains that it has not done so, and the Act, with all of the powers and privileges flow-

ing from it, has ever since remained and still remains in full force and effect.

The separation of the water from the land and the subjection of the water to appropriation would seem to have put an end to the whole riparian system of rights, at least until further action by the Congress or by the territorial or state governments reviving that system. No such action has been taken, and the States, by their constitutions and laws, have confirmed the system of appropriation. Private interests developed, and the waters became, if they were not originally, *publici juris*. How does all this bear upon the rights of the United States? Did its right continue to be riparian in character, or was it converted into a right of appropriation, or was there still some other kind of right? Was it more than usufructuary.[1] This is rather an elusive matter. If the Government was limited to an appropriative right of the ordinary kind, it was inchoate (hardly to be properly called a right at all) until perfected by application of water to the land. Does this mean that the right of the Government was no different from that of any other land owner? What was its relation to the land? Was it merely the usual right to apply so much water to the land as beneficial use might justify? What happened to the right as the Government proceeded to patent and part with its title to public lands? Was the right proportionately abridged? In a case where all of the public lands tributary to a stream were disposed of by patent was the right as to that stream then gone, or if it survived how might it be exercised?

[1]The similarities in principle and distinctions between the nature of rights in water and rights in land are discussed in the Restatement of Torts, Sec. 849, pages 347-350.

According to the declaration of Mr. Justice Sutherland, in *California-Oregon Power Co. v. Beaver Portland Cement Co.*, supra, Congress vested in the States power to "affect" the riparian rights of the United States. Was similar power given the States to "affect" the inchoate rights of the United States to appropriate water for the public lands or was the direct result of the Act to place the public lands in a position of parity with private lands with respect to state control and regulation. Subsequent history and later legislation indicate something approaching that in practical result.

In the construction and operation of theNorth Platte Project the Secretary of the Interior proceeded under authority of the Reclamation Act.[1] Provisions of that Act which may particularly bear on the position of the United States in this suit are as follows:

> *"Water right as appurtenant to land and extent of right.* The right to the use of water acquired under the provisions of the reclamation law shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right." (43 U. S. C. A., Sec. 372.)
>
> *"General authority of Secretary of Interior.* The Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this chapter into full force and effect". (43 U. S. C. A., Sec. 373).
>
> *"Vested rights and State laws unaffected by chapter.* Nothing in this chapter shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder,

[1]Act of June 17, 1902 (32 Stat. 388).

and the Secretary of the Interior, in carrying out the provisions of this chapter, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof." (43 U. S. C. A., Sec. 383).

"Establishment of 'reclamation fund'. All monies received from the sale and disposal of public lands * * * shall be and the same are hereby reserved, set aside, and appropriated as a special fund in the treasury to be known as the 'reclamation fund', to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion, and development of waters for the reclamation of arid and semi-arid lands. * * *" (43 U. S. C. A., Sec. 391).

The North Platte Project was initiated by a petition in the name of the Secretary of the Interior for a permit to construct Pathfinder Reservoir and to store therein unappropriated water of the North Platte River.[1] This petition was granted by the State Engineer of Wyoming. In connection with the petition there was an application by the Secretary for permit to construct canals and ditches. For example, United States Exhibit 17 relates to the Ft. Laramie Canal and is entitled "Application for a permit to divert and appropriate the water of the State of Wyoming". It describes the land to be served. The order granting the application fixes the time for completion of the canal, for application of water to the land, and for "final proof of appropriation". United States Exhibit 30 (Wyo. Ex. 33) is an application of the Secretary for permit to construct the Seminoe Reservoir.

[1]U. S.-10.

The form and nature of the "adjudications" are illustrated by Nebraska's Exhibit 571, which is a copy of the order made in the case of the Pathfinder Irrigation District. It recites that proofs of appropriation were submitted by the Pathfinder Irrigation District on behalf of the individual owners of land, the individual landowners being designated the "appropriators". They are severally enumerated, together with descriptions of their lands entitled to water, and to them the rights are decreed and to them certificates of appropriation are directed to be issued. Nebraska's Exhibit 572 is a specimen of the certificates of appropriation actually issued. It names an individual landowner as appropriator, specifies the amount of the appropriation in terms of one second foot for seventy acres, describes the acreage, and designates the priority date.[1] So far at least as form is concerned, there is nothing to distinguish the action or procedure followed by the Secretary from that ordinarily required of any private individual or corporation seeking a permit to erect storage facilities and canals to divert, store, and transport water to land to be irrigated. There is nothing to suggest that the Secretary intended or expected his action to have any other significance or legal effect than similar action by any private interest. I see no reason for regarding the

[1]The so-called repayment contracts under which irrigation districts organized by the land owners under the project assumed the obligations of the individual owners to the Government contain provisions which may be of some significance. For example, the contract between the Pathfinder Irrigation District and the United States (N-579) provides by Section 31, page 21: "The distribution of stored water from the Pathfinder Reservoir constructed by the United States on the North Platte river after the same is turned out of said reservoir into the river, will be in charge of the proper state officers or other officers charged by law with the distribution of stored water from North Platte river, and with the regulation of headgates for such purpose." By Section 42, page 27, it was provided that the dams, reservoirs, power plants, and appurtenant buildings should be maintained and operated by the United States.

action taken by the Secretary as an assertion of a previously existing right or as a "reservation" of water under such right or as a "withdrawal" of water, as by the "owner", from appropriation by others. If such was the intention of the Secretary he could hardly have chosen a more inept manner of making it manifest. His action gives clear evidence of a purpose on his part to conform to the direction of the Reclamation Act to proceed in conformity with state law. How could he do otherwise? What would be his authority to obtain water for the project by "reservation" rather than by appropriation? Resorting to "reservation" would not be proceeding according to state law. Wyoming law makes no provision for reservation.

The Desert Land Act says that all waters should remain and be free for the appropriation and use of the public for irrigation, etc. Until a repeal or revocation by the Congress, that statute commands obedience by Government officials as well as others. It does not authorize withdrawal of water from a general right of appropriation by land owners by "reservation", but only by appropriation, and no exception is made of the Government itself or its agents. In this connection it is to be remembered that a large proportion of the land under the North Platte Project is privately owned, and it would be particularly difficult to suppose authority of the Secretary to "reserve" water for such lands. Would the United States contend that the Secretary had authority to make a general reservation of water for all possible future projects? If so, he could readily nullify the congressional mandate that the water "shall remain and be free for appropriation".

Upon original acquisition of the territory ceded by France, Spain, and Mexico, the United States became both

sovereign and proprietor. When the state governments were set up, sovereignty, generally speaking, passed to them. Proprietorship of the land passed out of the Government in so far as it has parted with title by the issuance of patents. The Desert Land Act separated the water from the land. There has been no subsequent general grant or divestment of the rights of the United States in the unappropriated water by or under any congressional act, and it would seem that such rights must continue to exist. Just what the nature and incidents of such rights may be in the light of intervening facts is an interesting question, but one of little practical importance in this suit. So long as Federal law remains what it is, all waters either wholly or partly on the public domain are open to appropriation under the laws of the States. Rights therein can be acquired only by compliance with the conditions prescribed by those laws, and plenary administrative control exists in the States. The rights of the Secretary of the Interior or of the United States in respect to the storage of water for the North Platte Project are derived from "appropriation" under Wyoming law, using the word "appropriation" broadly as including the privilege of storing and delivering water to the project appropriators.[1]

[1]The foregoing interpretation of the Reclamation Act and its effect on the relative rights of the States and the United States is supported by the legislative history of that Act and of the Warren Act and by Department decisions, for which see the following: Message of the President, Dec. 3, 1901, Senate Journal, 57th Congress, First Session, pp. 9-10; House Committee Report No. 1468, 57th Congress, First Session, pp. 6-7; House Debate, Congressional Record, Vol. 35, Part 7, 57th Congress, First Session, pp. 6678-6680, 6687, 6766-6770; Decisions of the Department of the Interior, Vol. XXXII, p. 254; Debate on Warren Act, Congressional Record, Vol. 45, Part 4, 61st Congress, Second Session, pp. 3740-3748, 4259-4263, 4314-4324, Vol. 45, Part 5, pp. 4662-4669; Vol. 46, Part 3, 61st Congress, Third Session, pp. 2190, 2615, 2780-2784.

Upon the motion of Wyoming to dismiss this suit upon the ground that Colorado and the Secretary of the Interior of the United States were necessary parties, this Court said (295 U. S. 40, 43):

> "The motion asserts that the Secretary of the Interior is an indispensable party. The bill alleges, and we know as matter of law, that the Secretary and his agents, acting by authority of the Reclamation Act and supplementary legislation, must obtain permits and priorities for the use of water from the State of Wyoming in the same manner as a private appropriator or an irrigation district formed under the state law. His rights can rise no higher than those of Wyoming, and an adjudication of the defendant's rights will necessarily bind him. Wyoming will stand in judgment for him as for any other appropriator in that state. He is not a necessary party."

The conclusion is that the Secretary of the Interior (representing the United States) is an "appropriator" of water for storage for the North Platte and Kendrick Projects under the laws of Wyoming, and occupies the same position as any private appropriator of a similar water right. Whether the United States is, strictly speaking, the owner of a right to use the unappropriated water of the river is an academic question as far as the issues are concerned.[1]

Any apportionment, therefore, should be between the States of Nebraska, Wyoming, and Colorado. Needless to say, this contemplates no interference with the continued

[1] The question is in any event one of little practical importance for the reason that the river is already over-appropriated as far as the natural flow of the irrigation season is concerned, and is also pretty well exhausted by storage appropriations as to any additional out-of-season flows.

ownership and operation by the United States of its storage and power plants, works, and facilities.

RECOMMENDATIONS FOR DECREE

With respect to the water of the North Platte River and its tributaries, except the Laramie River, I recommend the entry of a decree:

1. Enjoining Colorado (a) from the diversion of water for the irrigation in North Park of more than 135,000 acres of land, (b) from the accumulation in storage facilities in North Park of more than 17,000 acre feet of water between October 1 of any year and September 30 of the following year, and (c) from the transbasin diversion out of North Park of more than 6,000 acre feet of water between October 1 of any year and September 30 of the following year.

2. Enjoining Wyoming (a) from the diversion of water from the main river above Guernsey and from its tributaries above Pathfinder Reservoir for the irrigation of more than 168,000 acres of land and (b) from the accumulation of storage water in reservoirs above Pathfinder Reservoir in excess of 18,000 acre feet of water between October 1 of any year and September 30 of the following year.

3. (a) Enjoining Wyoming from the storage of water in Pathfinder, Guernsey, Seminoe or Alcova Reservoir and from the diversion of natural flow water through the Casper Canal for the Kendrick Project, between and including May 1 and September 30 of each year, otherwise than in accordance with the rule of priority in relation to the appropriations of the Nebraska lands supplied by the French Canal and by the so-called State Line Canals, and adjudging all such Nebraska appropriations, for the purpose of this clause,

to be senior to those of the four reservoirs named and to that of the Casper Canal.

(b) Identifying and defining, for the purpose of clause 3 (a), the Nebraska lands and their supply canals referred to therein, their diversion limitations in second feet, and seasonal limitations in acre feet, as follows:

Lands	Canal	Limitation in Second Feet	Seasonal Limitation in Acre Feet
Tract of 1025 acres	French	15	2,227
Mitchell Irrigation District	Mitchell	195	35,000
Gering Irrigation District	Gering	193	36,000
Farmers Irrigation District	Tri-State	748	183,050
Ramshorn Irrigation District	Ramshorn	14	3,000

4. Enjoining Wyoming from operation of the Pathfinder, Guernsey, Seminoe and Alcova Reservoirs otherwise than according to the rule of priority in relation to each other, and defining the order of seniority as between said reservoirs to be, *first,* Pathfinder, *second,* Guernsey, *third,* Seminoe, and *fourth,* Alcova but providing that water may be impounded in the Seminoe Reservoir "out of priority" in relation to the Pathfinder and Guernsey Reservoirs for such use only in the generation of power by the Seminoe hydroelectric power plant as will not materially interfere with the administration of water for irrigation purposes according to priority as decreed under clause 3.

5. Restraining Wyoming from the recapture of return flow water of the Kendrick Project after it shall have reached the North Platte River and become commingled with the general flow thereof and from diverting water from the

River at or above Alcova Reservoir as in lieu of Kendrick return flow water reaching the river below Alcova.

6. Apportioning the natural flow water present in the Whalen to Tri-State Dam section, between and including May 1 and September 30 of each year, on the basis of 25% to Wyoming and 75% to Nebraska with the right in Nebraska to designate from time to time the portion of its share which shall be delivered into the Interstate, Ft. Laramie, French, and Mitchell Canals for use on the Nebraska lands served by these canals and restraining Wyoming from diversion contrary to this apportionment; providing that in the apportionment of water in this section the flow for each day, until ascertainable, shall be assumed to be the same as that of the preceding day as shown by the measurements and computations for that day; and providing that in the segregation of natural flow and storage water reservoir evaporation and transportation losses shall be determined in accordance with the formula and data which appears in the record identified as United States Exhibit 204A, unless and until Nebraska, Wyoming, and the United States may agree upon a modification thereof or upon another formula.

7. Requiring such additional gauging station and measuring devices at or near the Wyoming-Nebraska state line, if any, as may be necessary for effecting the apportionment decreed in clause 6, to be constructed and maintained at the joint and equal expense of Nebraska and Wyoming.

8. Permitting any of the parties to apply at the foot of the decree for its amendment or for further relief, and retaining jurisdiction of the suit for the purpose of any order, direction or modification of the decree or any supplementary decree that may at any time be deemed proper in relation to the subject matter in controversy.

Since injunction may not run against the United States, restraint in respect of the Government projects is proposed to be placed on Wyoming only. The United States occupying the position of an appropriator under the laws of Wyoming is as such amenable to the authority of that State and that State will stand in judgment for it.

It is assumed that the injunctions against Colorado and Wyoming will be construed as including restraint upon those States from *permitting* to be done the things which are respectively prohibited to them.

The parties are agreed that there should be no restriction upon the diversion from the North Platte River in Colorado or Wyoming of water for ordinary and usual domestic and municipal purposes and consumption. Nothing in the injunctions recommended is intended to or will interfere with such diversions and uses.

The foregoing recommendations are not interdependent. The fact that some of them might not be followed would not preclude the adoption of the others. In order of their importance to equitable apportionment, I should rank the first six recommendations as follows: 3, 6, 4, 2, 1, 5. Placing the operation of the Kendrick Project on a priority basis as proposed would in my opinion remove the most serious threat to equitable distribution that appears from the evidence. It is also important that the North Platte Project be operated on a priority basis, but there is little evidence of any serious violation of priorities in its past operation. The pecularities and importance of the Whalen-Tri-State Dam section have been quite fully discussed. Recommendation No. 2 is perhaps somewhat more important than No. 1, but I should consider any distinction insufficient warrant for the adoption of the one if there should be omission of the other.

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PART II.

DISCUSSION OF LEGAL ISSUES RESPECTING PROPOSED JOINT USE OF PATHFINDER, SEMINOE AND ALCOVA RESERVOIRS, KENDRICK PROJECT RETURN FLOWS, CONSTRUCTION OF WARREN ACT CONTRACTS; DETAILED REVIEW OF EVIDENCE CONCERNING PRIORITIES, ACREAGES IRRIGATED, AND WATER REQUIREMENTS OF LANDS SUPPLIED BY CANALS DIVERTING BETWEEN WHALEN, WYOMING, AND KINGSLEY RESERVOIR IN NEBRASKA, AND CONCERNING WATER LOSSES UNDER KENDRICK PROJECT. LARAMIE RIVER-WHEATLAND PROJECT. REVIEW OF PROCEEDINGS IN TAKING EVIDENCE AND ALPHABETICAL INDEX.

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PROPOSED JOINT OPERATION OF PATHFINDER, SEMINOE, AND ALCOVA RESERVOIRS—HOW AFFECTED BY CONTRACT OBLIGATIONS OF THE UNITED STATES.

This is additional to the discussion of the proposed joint operation appearing in Part I, pages 143 to 145. The desire of the United States is to pool the water to be stored in the three reservoirs and administer it as a common fund, or to permit the Seminoe to "borrow" storage water from the Pathfinder and vice versa. It is, however, recognized that there are some legal impediments to the carrying out of either proposal, arising from the differences in priority and the contracts entered into by the United States with the irrigators under the projects and with Warren Act contractors. With the project irrigators the contracts were formed by three steps: (1) The public notices given under Section 4 of the Reclamation Act; (2) applications filed responsive to the notices, and (3) acceptance of the application by the United States. There were two different forms of description of the water rights,[1] one of which was in the following language:

> "The quantity of water to be furnished hereunder shall be . . . . . acre feet of water per annum per acre of irrigable land as aforesaid, measured at the land, or so much thereof as shall constitute the proportionate share per acre from the water supply actually available for the land under said project; * * *."

The other description contained this language:

> "The measure of the water right for said lands is that quantity of water which shall be beneficially used for the irrigation thereof, but in no case exceeding the share, proportionate to the irrigable acreage, of the

[1] U. S.-43-50.

water supply actually available as determined by the Project Manager or other proper officer of the United States. * * *"

It would appear that by this language the United States agreed, at least impliedly, that it would make available within the limitation fixed the maximum reasonably possible within its own right and by use of its own facilities.

When it came to the so called repayment contracts of 1926, under which contracts with individual land owners were assumed by irrigation districts, (referring, for example to the Pathfinder Irrigation District Contract, Nebraska's Exhibit 570), it was agreed that the project lands would be entitled to the same water rights to which they were entitled under all existing contracts and water right applications (Sec. 60). It was elsewhere (Sec. 58) provided that:

"While there is an adequate supply of water in the Pathfinder and Guernsey Reservoirs, the amount of water delivered to the district shall be limited only by the carrying capacity of the Interstate Canal as it now is or as it may hereafter be enlarged; * * *."

In its context this strongly implies an agreement that the United States, so far as might reasonably lie within its power, would provide and maintain an adequate supply of water in Pathfinder and Guernsey Reservoirs.

The Warren Act contracts (taking for example the Tri-State Land Company contract of August 20, 1912, Nebraska's Exhibit 531) recite that the United States has

completed the Pathfinder Reservoir "from which certain surplus storage waters are available for disposal under the terms of the Warren Act," and provide (Sec. 1) that:

> "The United States will impound and store water in the Pathfinder Reservoir or elsewhere and release the same into the North Platte River, and will supply water from other sources for the Company's canal * * * at such times and in sufficient quantities to deliver and does hereby agree to deliver for use of the Company an amount of water which will, with all of the water the Company may be entitled to by reason of any appropriation and all water to which the lands of said irrigation district are entitled and all water not otherwise appropriated, including drainage and seepage waters developed by the United States, aggregate a flow of water as follows: * * *." (Here follows delivery schedule.)

The agreement to supply water is expressly made subject to the prior rights of the project canals (Article 12) but the only other express qualification of the Government's obligation is that it

> "shall not be liable for failure to supply water under this contract caused by hostile diversions, unusual drought, interruption of service made necessary by repairs, damage caused by flood, unlawful acts or unavoidable accident." (Sec. 10)

By Section 13 it is provided that:

> "It is understood that the Secretary shall provide for the irrigation from the Pathfinder Reservoir of no greater area of land in the aggregate than can in his

opinion be furnished with an adequate supply of water in all years of ordinary run-offs."

Should the United States undertake a joint operation of the Pathfinder, Seminoe, and Alcova Reservoirs, and adopt a practice of loaning water by the Pathfinder to the junior Seminoe, between which reservoirs there is no contractual relation, and as a result should disable itself from performing its Project or Warren Act contracts, it would become chargeable with a disregard of its obligations under those contracts. Manifestly the decree in this case should not appear to authorize or countenance any course of action or practice on the part of the United States which might endanger its ability to render full performance of those contracts.

The contract between the United States and the Casper-Alcova Irrigation District of August 30, 1935 (Wyoming's Exhibit 3) provides by Sec. 9 as follows:

> "It is expressly agreed that the development of the Casper-Alcova Project and the irrigation of lands under it is in no way to impair the water rights of the Federal North Platte Reclamation Project in Wyoming and Nebraska, and the said North Platte Project and Warren Act contractors under it are to receive a water supply of the same quantity as would have been received if the Casper-Alcova Project had not been constructed and operated."

The project canals and the Warren Act contractors quite possibly occupy the position of third party beneficiaries, with a right of enforcement of this provision.[1] If so, the

[1] Restatement of Contracts, Sections 133-147.

joint operation of the reservoirs or the borrowing practice might justifiably be opposed by them as a violation of the provision.

The necessary conclusion appears to be that the various contractural obligations of the United States referred to of themselves preclude joint operation of the reservoirs or the proposed borrowing practice.

KENDRICK RETURN FLOWS.

The United States has declared its intention of claiming the return flow water from the Kendrick Project even after it shall have reached the river and joined the common supply flowing therein, and it has also announced that it will, or may, enforce its claim by taking for Kendrick Project use, in substitution for return flow water escaping to the river, other water divertable into the Seminoe or Alcova Reservoir directly from the river. Whether it may also assert the right to reclaim return flows after they have passed down the river to Whalen, to be diverted for use of the North Platte Project, is a point on which I believe the United States has not declared itself.

There is thus raised the legal question as to the extent of right of an irrigation project to re-use the seepage or return flows from the project and as to how or under what conditions that right may be lost.

Ide v. United States, 263 U. S. 497, is one of the leading authorities on this subject. The rule was there laid down (p. 506), quoting with approval from the opinion of the district judge in *United States v. Haga*, 276 F. 41, 43:

> "One who by the expenditure of money and labor diverts appropriable water from a stream, and thus

makes it available for fruitful purposes, is entitled to its exclusive control so long as he is able and willing to apply it to beneficial uses, and such right extends to what is commonly known as wastage from surface run-off and deep percolation, necessarily incident to practical irrigation. Considerations of both public policy and natural justice strongly support such a rule. Nor is it essential to his control that the appropriator maintain continuous actual possession of such water. So long as he does not abandon it or forfeit it by failure to use, he may assert his rights. It is not necessary that he confine it upon his own land or convey it in an artificial conduit. It is requisite, of course, that he be able to identify it; but, subject to that limitation, he may conduct it through natural channels and may even commingle it or suffer it to commingle with other waters. In short, the rights of an appropriator in these respects are not affected by the fact that the water has once been used."

In *Ramshorn Ditch Co. v. United States,* (8 C. C. A.) 269 F. 80, 83-4, it was said:

"Seepage and waste water may be said to have been abandoned by the original appropriator when it is returned or allowed to return to its natural channel with no intention on the part of the appropriator of recapturing it. To constitute abandonment, however, there must be an intention to abandon, (citing cases) the existence or non-existence of which is a question of fact. * * *"

In *Rock Creek Ditch & Flume Co. v. Miller,* 93 Mont. 248, 17 P. (2d) 1074, 89 A. L. R. 200, it was said that the general rule is that:

"The owner of the right to use the water * * * may collect it, recapture it, before it leaves his possession, but after it gets beyond his control it thus becomes waste and is subject to appropriation by another."

In the *A. L. R. Annotation,* 89 A. L. R. 210, many cases on this subject are reviewed. One of the conclusions deduced (227) was that:

"Where nothing is done to recapture or reclaim escaped water before it reaches a stream, but it is permitted to flow or percolate by its natural course into the stream and intermingle with the waters of the stream, it is generally held that in such a case the escaped water is not subject to recapture."

It was also concluded (p. 231) that:

"Where water is intentionally emptied into a natural stream for the purpose of conducting it to another point, the stream being used simply as a conduit in lieu of an artificial canal or ditch, and there is no intent on the part of one emptying the water into the stream to abandon such water, it is universally held that the water may be recaptured from the stream."

In *United States v. Tilley,* (8 C. C. A.) 124 F. (2d), 850, it was held that the United States was entitled to use and apply the seepage from one division of the North Platte Project to supply lands of another division as against the claim of Nebraska of a right to intercept the seepage water and apply it to Nebraska lands having an appropriation senior in point of time to the North Platte Project.

It was also suggested that there was some authority to the effect that seepage water from irrigation entering a stream by natural drainage or percolation might be re-

claimed by the appropriator at a lower point on the stream. There is, I think, however, no authority for such a proposition under facts analogous to those presented by the expected return flows of the Kendrick Project, and I am convinced that such return flows should be held abandoned by the United States if and after they shall have been permitted by process of natural drainage to join and intermingle with the waters of the North Platte River. The first opportunity the United States could have to reclaim these return flows would be at Whalen, where physically they could be diverted to the Interstate or Ft. Laramie Canal. Before reaching that point they would have flowed about 200 miles down stream from the Kendrick lands, being subject en route to transportation and channel losses. Throughout the section the river is also drawn upon by a multitude of diversions, all senior to the Kendrick Project. If the United States were entitled to the return flows at Whalen, it would follow that no appropriator above Whalen would have a right to deplete them by prior diversion. If the United States did not choose to divert the return flow water at Whalen, then its right, if it existed at all, would follow this water to the state line and below for possible diversion and application to its Warren Act contract requirements. This would be so disruptive of orderly administration of irrigation water from the river as to be intolerable. For the proposal of the United States to divert and appropriate other waters at or above Alcova, in substitution for Kendrick return flow waters allowed by natural drainage to reach the river and commingle with the general flow, there is, I believe, no authority whatever, and I am satisfied that such a practice should not be permitted.

WARREN ACT CONTRACTS.

As already mentioned (page 35), there is a serious question as to the proper construction and effect of these contracts. It has been argued, especially by Wyoming, that these contracts fix the maximum limit of water, natural flow and storage, to which the contracting districts are entitled. This is based upon three points: *first*, that the contracts furnish conclusive evidence as to beneficial use; *second*, that the contracts include an agreement by the districts to limit their demands to the contract specifications; *third*, that most of the contracts (all of the Nebraska contracts except that of Farmer Irrigation District) contain a clause by which all of the appropriative rights of the districts were assigned to the United States in consideration of the agreement by the United States to deliver the quantities of water designated in the prescribed schedules. The importance of the question is minimized (in relation to this suit) if the requirements found do not in any event exceed the Warren Act contract quantities. As set up in this report, the requirement does not in any case very substantially exceed the Warren Act contract amounts and in some cases is considerably less. The quantities in acre feet specified in the contracts as approximate and the requirement set up herein are as follows:[1]

[1]Copies of these contracts are in the record, bearing exhibit numbers as follows: Hill Irrigation District, W-20, 21, 22; Lingle Water Users Association, W-23, 24, 25; Lincoln Land Company (Rock Ranch Canal), W-29; Gering Irrigation District, N-530; Farmers Irrigation District, N-531; Central Irrigation District, N-532; Chimney Rock Irrigation District, N-533; Browns Creek Irrigation District, N-534; Beerline Canal Company, N-535.

	W. A. C.	Requirement
Hill Irrigation District	13,522	11,655
Lingle Water Users Association	40,048	34,299
Lincoln Land Company (Rock Ranch Canal)	1,941	2,194
Gering Irrigation District	35,500	36,000
Farmers Irrigation District	180,000	183,000
Central Irrigation District	4,050	4,160
Chimney Rock Irrigation District	10,300	12,500
Browns Creek Irrigation District	19,900	13,000
Beerline Canal Company	1,639	2,000

The general nature of these contracts, so far as bearing on the points at issue, may be seen from the provisions which will be quoted. After preliminary recitals comes the following (quoting from the Gering contract):

"ARTICLE 1. The United States will impound and store water in the Pathfinder Reservoir, or elsewhere, and release the same into the North Platte River at such times and in sufficient quantities to deliver, and does hereby agree to deliver at the Wyoming-Nebraska State line for the use of said District an amount of water which will, with all the water the lands of the District may be entitled to by reason of any appropriations and all water not otherwise appropriated, including drainage and seepage waters developed by the United States, aggregate a flow of water as follows: [Here follows the delivery schedule]; the total amount to be so delivered being approximately 35,500 acre feet."

"ARTICLE 5. It is agreed that beneficial use shall be the basis, measure and limit of all right acquired by the District hereunder * * *."

"ARTICLE 10. In order to enable the United States to deliver the supply of water herein specified on the basis of payments as herein provided the said District hereby assigns to the United States all its

rights, title, and interest to the waters of the North Platte River over and above the amounts provided in this contract, and limits its claims to such amounts * * *."

The Farmers Irrigation District contract does not contain the assignment provision last quoted from Article 10 of the Gering contract, but does contain a provision (Article 9) reading as follows:

"The delivery of the water supply provided for in this contract will be accepted by the company as in full satisfaction of all its rights to the water of the North Platte River, both natural flow and surplus storage from the Pathfinder Reservoir and other reservoirs of the Reclamation Service constructed in connection with the North Platte Project."

All of the contracts contain, at least in substance, the provisions quoted from Articles 1 and 5 of the Gering contract. All of the Nebraska contracts, except that of Farmers Irrigation District, and the Rock Ranch Wyoming contract contain the assignment provision quoted from Article 10 of the Gering contract. The Lingle contract contains the "full satisfaction" provisions of the Farmers Irrigation District contract.

The Tri-State contract was construed in the recent case of *United States v. Tilley*, 124 F. (2d) 850 (8 C. C. A.). The points decided respecting the construction of the contract were:

1. The purpose of the contract is to provide a supply of storage water to supplement water receivable under the natural flow appropriation. This conclusion was strengthened by practical construction.

2. The contract did not operate as an assignment to the United States of any natural flow rights because (a) an assignment clause was not inserted but was intentionally omitted; (b) appropriative rights under Nebraska law are attached to the land and are not assignable. While this was first adopted as a statutory rule in 1895, water rights originating prior to the enactment of the statute could be transferred from one tract to another only with approval of the state irrigation authorities; (c) even though the legal rights possessed by the canal company had been assigned, this would not have operated to deprive the land owners of the beneficial use of the appropriated waters or permitted a change in the locational use of such waters; (d) the rights of a canal company with respect to waters appropriated become dedicated to the use of the lands which the canal was constructed to serve and to which the waters have been applied. Such a canal company cannot deprive the owners of the continuing benefit of this dedicated use without their express consent.

3. The "full satisfaction" provision of the contract did not divest the land owners of their natural flow rights. The provision was not effective as a release or abandonment as against the land owners because the canal company had no power over such rights and could not validly contract them away. Had there been any abandonment, the rights released would not in any event have passed to the United States under the contract, but would have become extinguished.

It is argued that some of the alternative conclusions of the Court are obiter. They probably come within the rule that when a court places its decision upon two or more separate grounds none is dictum. *14 Am. Jur.*, Sec. 83, p.

298; *15 C. J.*, Sec. 344, p. 953; *Ontario Land Co. v. Wilfong*, 223 U. S. 543.

The language of all the Warren Act contracts strongly indicates that at the time the contracts were made the parties regarded the supply provided for in the contracts as sufficient and intended by the terms of the contracts to limit their total demands for natural flow and storage water to the quantities specified. Do the contracts have that legal effect?

The Gering appropriation, alone of the Nebraska Warren Act contracts, was subsequent to the Nebraska Act of 1895 and is subject to the statutory rule that the appropriation is appurtenant to the land and is not transferable and not assignable. It appears to follow that the assignment clause of that contract is by virtue of the statute invalid. To the assignments contained in the other contracts there is no showing of consent by the Nebraska irrigation authorities. It may be that this does not render the assignments absolutely void, but the consent would appear to be at least a condition precedent to their enforcibility. Until there is such a consent, the assignments cannot be regarded as effective.

Can these contracts be construed as effecting a relinquishment of natural flow rights above the contract specifications? The agreement of the United States in the Nebraska contracts is to deliver at the Wyoming-Nebraska state line "an amount of water which will, with all the water the lands of the District may be entitled to by reason of any appropriation and all water not otherwise appropriated, including drainage and seepage waters developed by the United States, aggregate a flow of water as follows: * * *". The reference here to natural flow, drainage, and

seepage water is only by way of limiting the quantity of storage water deliverable under the contract, and does not necessarily import a surrender or disclaimer of any natural flow right. The agreement of the districts in the assignment provisions to "limit their claims to such amounts" as are provided for in the contracts suggests a restriction upon pre-existing rights. It was unnecessary so far as supplemental storage water was concerned, for that was already limited by the terms of the agreement as to deliveries.

If the language of the contracts should be construed as expressing an agreement to abandon or waive any right or claims to water above the rates of flow and total quantities specified in the contracts, would such an agreement be valid? The *Tilley* case says that canal owners cannot validly make such a contract. How about an irrigation district? It is a public corporation of which the members are the appropriators within its territorial limits. They elect a board of directors. The boards authorized these contracts. Does that validate them as against the land owners? The authorizing action of a board of directors cannot give validity to a contract ultra vires a corporation. These contracts, in so far as they purport to bargain away any water rights of the individual appropriators would appear to be ultra vires for the reason that these rights are not the property of the district. It would seem a logical extension of the rule of the *Tilley* case to say that the district has no more power than a canal company to contract with reference to the individual appropriative rights of the land owners. That such rights are strictly personal to the water users and attached to the land was emphasized in *Ickes v. Fox*, 300 U. S. 82, and in the subsequent case between the same parties in the Court of Appeals for the

District of Columbia, 137 F. (2d) 30, involving the Reclamation Act and laws of the State of Washington.

A natural question in relation to the abandonment theory is as to what advantage or benefit could accrue to the United States from a release (as distinguished from an assignment) of appropriative rights which would explain the purpose of inserting such a provision in the contracts. A release would be equivalent to an extinguishment of the right.

As a matter of construction I would say that the contracts evidence an intent, as between the parties to them, to limit the total water to be delivered, natural flow, seepage, drainage and storages, to the rates and amounts specified in the contracts. The circumstances surrounding the execution of the contracts are consistent with and indicate such intent.[1]. However, I am not able to see how, with due regard to the authority of the *Tilley* case, it can be held that these contracts have any validity as an assignment or surrender of the natural flow rights of any individual appropriator.

[1]R. 20454-6, 21245-80.

EVIDENCE CONCERNING THE WHALEN-TRI-STATE DAM SECTION.

FT. LARAMIE CANAL.

Priority and Acreage.

This is a North Platte Project canal having an appropriation of 1,530.4 second feet, with a priority of December 6, 1904. According to the terms of the appropriation 731.74 second feet, or 47.8 per cent of the appropriation, are for Wyoming and 798.66, or 52.1 per cent, are for Nebraska lands. At the ratio of one second foot to 70 acres, the appropriation would cover 107,128 acres. The irrigable acreage as determined by the Secretary of the Interior is 107,330 acres, of which 52,487 acres, or 49 per cent, are in Wyoming and 54,843 acres, or 51 per cent, are in Nebraska.[1] The canal serves the lands of the Goshen Irrigation District and the Wright and Murphy lands in Wyoming and the Gering-Ft. Laramie District in Nebraska.

The contentions of the parties as to the proper acreage to be considered in determining water requirement are as follows:[2]

Nebraska—107,128 acres, 51,222 for Wyoming (excluding Wright and Murphy lands) and 55,906 for Nebraska;

Wyoming—104,710 acres, without segregation as between the States and including 210 acres Wright and Murphy lands;

United States—105,000 acres;

Colorado—90,000 acres.

Nebraska's Exhibit 566 was introduced through the testimony of Charles E. Klingman, secretary and accountant of

[1] U. S.-75, 76.
[2] W-158, 160; E. 27446-47, 28612-15.

the Gering-Ft. Laramie Irrigation District.[1] It shows 54,871 acres of land under certificates of appropriation which are irrigable and have at some time been irrigated. It also lists an additional 445 acres under Wyoming permit, of which 123 acres have been irrigated. Some other small tracts are said to be irrigated, but apparently without any water right. Limiting the acreage to that currently demanding and using water, the maximum appears to be 55,000 acres. Concerning the 54,871 acres shown on Nebraska's Exhibit 566, Mr. Klingman testified that that area "represents the irrigable acreage", and answered affirmatively the question "And does it represent the acres actually irrigated as shown by your records?" And again answered in the affirmative the question "Then these acreages * * * represent the acres actually irrigated or that have been irrigated under the years mentioned?" He also testified that this entire acreage is covered by certificates of appropriation. The witness apparently did not intend to say that of his own knowledge this entire acreage was wholly irrigated in any one year.

Wyoming's principal witness on acreage was Jack Harman, cost accountant and water record clerk for the Goshen Irrigation District. He testified that approximately 53,000 acres had been irrigated in the district, and that approximately 49,000 acres "is irrigated from year to year". Also he said that there were about 4,000 additional acres within the boundaries of the district that could be irrigated, making a total of 57,000 acres irrigated and irrigable within the district. The total adjudicated acreage he gave as 51,170, including 47,850 acres holding certificates of appropriation and an additional 3,372 acres adjudicated with certificates

[1] R. 14925-60.

in process of issuance.[1] Floyd M. Roush, superintendent of the district, testified that the total acreage expected to be irrigated in 1939 was 49,256, and that the figure for 1938 was 49,500.[2]

The North Platte Project history, as compiled and maintained by the Bureau of Reclamation, includes annual reports containing information collected by the fieldmen of the Bureau, and in some instances reports by the officials of the Irrigation District. Wyoming's Exhibit 158 is compiled from these reports. For the year 1940 there is shown for the Ft. Laramie Division the following: "Works completed irrigable acreage," 107,332; "developed farms irrigable acreage," 104,601; "net cropped acreage," 97,681. Except for the net cropped acreage of 1938, the 1940 figures under all three captions are the maximum for the history of the division. The works completed irrigable acreage shows but minor variations since 1926, the gain from that year until 1940 being only 552 acres. The 1940 figure equals the irrigable acreage as originally determined by the Secretary of the Interior. The developed farms irrigable acreage value for 1940 is 12,451 acres above the 1926 figure, and there has been a consistent year-by-year increase in this value ever since 1934. The United States maintains that the acreage under this caption is the proper one for use in determining water requirements.

There is considerable confusion in and difference of opinion regarding the terminology used in the project history. The history is lacking in consistency in this respect. While adopting "developed farms irrigable acreage" as representing irrigated acreage for the purpose of his study, Elmer K.

[1] R. 15361-3.
[2] R. 15459-60.

Nelson, engineer and witness for Wyoming, was of the opinion that this was nearly always somewhat in excess of actual irrigated acreage.[1] He explained the variations in the use of terms from year to year and the relationship between them as he understood it.[2] Barry Dibble, engineer and witness for the United States, was of the idea that works completed irrigable acreage is that acreage for which the canal system is constructed and ready to deliver water, and that developed farm irrigable acreage is the acreage for which the project can be prepared to deliver water in any one year.[3] He testified (in relation to the Interstate Canal) that the irrigated acreage which he adopted was about 93 per cent of the "works completed irrigable acreage," and he answered yes to the question "Is it your opinion that on projects of this type, with land of the type to which you have referred, that about seven per cent of the total irrigable land is land which in normal operation would not be calling for water at any one time?"[4] If this rule were applied to the Ft. Laramie Division, and assuming "works completed irrigable acreage" had reached its full development in 1940, the corresponding irrigated acreage would be 99,828 acres. Colorado considers the irrigated acreage to be represented by "net crop acreage". It was suggested on behalf of the Government that this term was used to exclude irrigated pasture or possibly native hay.[5]

From all the evidence I think the proper conclusion is that the acreage actually irrigated is something less than the "developed farms irrigable acreage"; also that although the developed farms figure has consistently risen in recent years,

[1] R. 27440-1.
[2] R. 27482-7.
[3] R. 28619-20.
[4] R. 28621-2.
[5] R. 20135.

the upward trend must be about exhausted, since the 1940 figure is only two and one-half per cent below the "works completed irrigable acreage". It seems a reasonable conclusion that not more than 103,500 acres are being irrigated in any one year, and that that figure would adequately represent the current demand acreage. As a proper division between Wyoming and Nebraska, 50,000 acres for Wyoming and 53,500 acres for Nebraska, is indicated. In addition, there is the Wright and Murphy land in Wyoming, comprising 210 acres.

Water Requirement.

The estimates of the parties are as follows, requirements being expressed in terms of acre feet per acre:

	Headgate Requirement	Canal Loss	Requirement at Land
Wyoming	2.67	40%	1.6 [1]
United States....	2.76	40%	1.66[2]
Nebraska .....:	3.15	43%	1.8 [3]
Colorado	3.15	43%	1.80[4]

Study of the matter of requirements logically begins with the quantity of water needed at the land. The estimate of 1.6 acre feet per acre by Mr. Nelson for Wyoming was arrived at by investigation and study rather than upon the basis of any historical record.[5] Mr. Dibble for the United States based his figure of 1.66 acre feet per acre upon the project history for the seven years 1930 to 1933 and 1937 to 1939. The selection of those years he justified upon the ground that "those years are years of normal or close to

[1] W-160.
[2] U. S.-267.
[3] N-631.
[4] C-104.
[5] R. 27441-8.

normal water supply and in my opinion the average use for those years gives a reasonable normal supply".[1] Mr. Meeker[2] for Nebraska took as his basis the years 1928 to 1933 as "fairly representative years", and thereby arrived at the rate of 1.8 acre feet per acre.[3] If the Wyoming delivery figures for the same years be taken, the result would be an average of 1.72. The six years selected by Mr. Meeker were the six years of highest delivery between 1928 and 1940 except for the year 1937, which slightly exceeded the year 1930. The delivery rate for each of the years 1928 to 1940, according to Nebraska's Exhibit 626 (Wyoming figures[4] where different from Nebraska's being set opposite in parentheses), is as follows:

1928	2.01	(1.72)
1929	1.74	(1.51)
1930	1.59	(1.41)
1931	1.63	(1.57)
1932	2.01	(2.06)
1933	1.82	(2.04)
1934	.59	
1935	1.01	
1936	1.21	
1937	1.61	
1938	1.58	
1939	1.47	
1940	.58	

The historical delivery rates for the years 1919 to 1929 (omitting 1920 and 1923 for lack of information) average 1.58.[5] During this period (excluding the short year 1919) the releases at Pathfinder averaged 1,388,000 acre feet a year, furnishing the canal almost an unlimited opportunity

[1] R. 29232.
[2] Ralph L. Meeker, engineer and witness for Nebraska.
[3] R. 26184.
[4] W-158, 160, 160-B; R. 27685, 29230.
[5] R. 29231.

for diversion.[1] Mr. Dibble thought the deliveries these years were not a proper guide because 1920 to 1929 was a period of more than normal precipitation, producing the amount of water necessary for irrigation.[2] Wyoming points out that for the years in question the precipitation at Ft. Laramie was below the 1900-1938 average.

The average for the years 1931 to 1940, inclusive, was 1.37. Omitting the years 1934 and 1940 (abnormally low years) the average for the remaining eight years would be 1.58. The average for the years 1930 to 1933 and 1937 to 1939 would be 1.64. These averages are on the basis of the delivery figures as computed by Wyoming, which, as noted, are somewhat at variance with those offered by Nebraska.

A factor urged by Colorado is that of ground water storage. Mr. Patterson[3] estimated that in the Whalen-Bridgeport section from about 1910 to 1930 ground water storage depleted the total water supply about 300,000 acre feet per year as an average. He thought this process now substantially completed and that a diminution in the necessary diversions and application of water to the land would result.[4]

There was testimony by Floyd M. Roush, superintendent of the Goshen Irrigation District, to the effect that the water users of the district "were all taken care of very nicely" in 1938 on a delivery at the land of 1.45 acre feet per acre.[5] In the same year the precipitation as recorded at an experiment farm at Torrington, Wyoming, was 13.8 inches. Thus, precipitation plus 1.45 acre feet irrigation delivery would supply a total of 31.2 inches to the land.

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[1] R. 29282.
[2] R. 29285.
[3] C. L. Patterson, engineer and witness for Colorado.
[4] R. 24454-73.
[5] R. 15468.

A delivery rate of 1.65 would seem liberal rather than conservative. If there be added to that figure the long-time mean precipitation at Ft. Laramie, Scottsbluff, and Bridgeport, the sum for total seasonal and annual supply would be: With Ft. Laramie precipitation, 27.06 and 34.6 inches; with Scottsbluff precipitation, 28.65 and 35.98 inches; with Bridgeport precipitation, 28.5 and 35.53 inches.

Canal Losses.

The remaining factor is transportation loss. Nebraska, on its Exhibit 626, shows a delivery rate of 55 per cent, and on Exhibit 631 a rate of 57 per cent. Both were apparently derived from data covering the years 1928 to 1940, inclusive. A comparison between Nebraska's Exhibit 626 and Wyoming's Exhibit 160-B discloses that the values under "water delivery to farms" on 626 correspond almost exactly with the values on line 7 "delivered farms" of 160-B. The values, however, under "net water supply" on 626 vary rather widely from the figures on line 8 "net supply" of 160-B, except for the year 1934. An explanation of the make-up of Wyoming's Exhibit 160-A and 160-B appears in the record at pages 29442-51.

On Wyoming's Exhibit 160-B, Mr. Nelson computes the average delivery for the years 1925 to 1940, excluding 1934, 1935, and 1940, to be 59.5 per cent, and suggests for adoption 60 per cent. The delivery rates for 1934, 1935, and 1940 were respectively 47 per cent, 55 per cent, and 45 per cent.

The United States agrees with Wyoming that the delivery rate should be 60 per cent.

On the whole, a delivery factor of 60 per cent (loss factor, 40 per cent) appears to be indicated. The diversion rate

then will be 2.75. On this basis the headgate allotment will be: *Wyoming:* Goshen Irrigation District, 50,000 acres at 2.75 = 137,500 acre feet; Wright and Murphy land, 210 acres at 2.75 = 577.5 acre feet. *Nebraska:* Gering-Ft. Laramie District, 53,500 acres at 2.75 = 147,125 acre feet.

In terms of second feet, the allotment is: Goshen Irrigation District, 714; Wright and Murphy land, 8, and Gering-Ft. Laramie District, 764.

INTERSTATE CANAL.

Priority and Acreage.

This also is a North Platte Project canal with a priority of December 6, 1904. It serves in Wyoming the Hill Irrigation District and Lingle Water Users and a small area within the Pathfinder Irrigation District, and in Nebraska the main lands under the Pathfinder Irrigation District. The Lingle and Hill lands have two appropriations, one of September 6, 1901 of 154.25 second feet for 10,797.58 acres, the other of December 6, 1904 of 30.89 second feet for 2,162.62 acres; total acreage 12,960.2. The appropriation of the Pathfinder Irrigation District is 1,625.55 second feet for 113,788 acres. Of this appropriation 1,591.99 second feet for 111,439.3 acres is for Nebraska and 33.56 second feet for 2,349 acres is for Wyoming.[1] As determined by the Secretary of the Interior as of 1938, the irrigable acreage of Lingle Water Users and Hill Irrigation District was 15,400, and of the Pathfinder Irrigation District 112,959.[2]

For Lingle and Hill, Wyoming proposes 14,200 acres, Nebraska 12,960, and United States 14,160. Wyoming's

[1] N-632.
[2] U. S.-74, 75.

Exhibit 29 is a list of the irrigable acres included in the certificate of appropriation of the Lingle Water Users. The total acreage shown is 11,496.2, and the witness Reid testified that to his knowledge all of this land had been irrigated at some time in the past, but that he was unable to say that this occurred each year.[1] An additional 622 acres are listed on pages 1 and 2 of this exhibit which have no contract with the Association, but some part of which is said to be irrigated.[2] The acreage upon which operation and maintenance assessment is paid fluctuates from 11,288 to 11,717.[3] Between 1,000 and 1,200 acres on the average did not pay operation and maintenance charges from year to year.[4] There were 700 to 1,200 acres out of the total of 11,496.2 which Mr. Richling, secretary-treasurer, could not say had been irrigated since April 1, 1925.[5] On cross-examination Mr. Richling admitted that there were various tracts that had not been irrigated to his knowledge in the past six or eight years, and counsel for Nebraska computed that the total acreage of such tracts was 1,677.[6] Nebraska's Exhibit 595 lists tracts on which payment of assessments was in default for *any* period of five consecutive years. It describes 1,941 acres. On the major part of this acreage, however, the assessments had later been paid up. The acreage in the Hill District for which operation and maintenance charges are paid is 3,704, but Mr. Parry, the witness who so testified, admitted that he did not know whether this number of acres were actually irrigated.[7] Wyoming's Ex-

[1] R. 15579-80.
[2] R. 15579.
[3] R. 15681.
[4] R. 15687-8.
[5] R. 15636.
[6] R. 15692.
[7] R. 15515-6.

hibit 16 is a list of lands in the district with the years in which water was first applied. The total acreage shown is 3,723, and Mr. Reid, attorney for the district, testified that all of these acres had been irrigated.[1] There appears to be no direct testimony as to how many acres in the Hill District were irrigated in any one year. As a measure of year-to-year demand, 3,500 acres for Hill and 10,300 for Lingle, total 13,800 acres, would correspond with the weight of the evidence.

For the Pathfinder Irrigation District, Nebraska's Exhibit 569 is a list of the Nebraska lands showing acres "irrigable in each farm unit and the year when water was first applied". The aggregate is 111,439.3. This acreage, according to the witness Parry (manager of the district) is that for which water was delivered; whether any of it was omitted from irrigation he did not know.[2] He conceded there should be a deduction of about 240 acres.[3] There are in the Pathfinder District about 2,700 or 2,800 acres of Wyoming land.[4] This land is listed on Nebraska's Exhibt 631 as 2,349 acres.[5] The purport of Mr. Parry's testimony is not altogether clear. It can hardly be supposed that he intended to testify that water was delivered every year to the entire acreage listed in Nebraska's Exhibit 569 except for 240 acres. The list includes all irrigable land under the appropriation,[5] and it is incredible that all such land should be irrigated every year. In its Exhibit 631 Nebraska concedes that there should be a reduction of 11,439.3 acres on account of "poor sandy soil," thus reducing the irrigated acreage to 100,000 acres.[6] This is for Nebraska land only.

[1] R. 15527-29.
[2] R. 14976-8.
[3] R. 14985.
[4] R. 14999.
[5] R. 14972.

Wyoming's proposed 94,500 acres is based upon 1936-1940 average of "developed farms irrigable acreage.[1] Even this Wyoming claims to be largely in excess of the acreage actually irrigated.

Colorado contends for an acreage of 86,820, being the average of "irrigated acreage" for the years 1925 to 1929 and 1932 to 1938, as reported by the Secretary of the Interior and as shown on Wyoming's Exhibit 156. The project history's "net cropped acreage" was reported to the Census Bureau as the irrigated land in all reports except the last one, in which irrigated lands agree with "developed farms irrigable acreage".[2] To that time the reports of the Bureau and of the Secretary had shown substantially the same figures for "net cropped acreage" and "irrigated acreage".[3] Colorado's inspection and aerial photograph and mosaic of the area were not able to find irrigated lands as much as the reported "net cropped acreage".[4]

According to the project history[5] the "works completed irrigable acreage" has remained at substantially 113,000 acres since 1926. On the other hand, the "developed farms irrigable acreage" reached its highest point in 1920, and the trend from that year has been generally downward, being under 100,000 each year since 1933 and ending with 93,335 in 1940.

Mr. Dibble's figure of 105,000 acres corresponds roughly with the "developed farms irrigable acreage" for the years 1927, 1928, and 1931, and is not quite as large as for 1918, 1920, and 1921. He left the latter three years largely out of consideration because of the considerable boom in agri-

[1] W-160; R. 27440.
[2] R. 29417.
[3] R. 29418.
[4] R. 29417.
[5] W-157.

cultural development which obtained during those years due to the World War. On the other hand, he thought the lower figures from 1934 to 1940 might have been influenced by the depression, which ran through that period. He admitted that the same economic conditions were probably in effect on the Ft. Laramie Canal, which showed an opposite tendency during the same years.[1] The United States has argued that the economic depression and drouth affected the Interstate more severely than the Ft. Laramie because of the larger proportion of "borderline" land on the former. There is no very definite testimony on this subject.

It may be noted from Wyoming's Exhibit 156 that "irrigable acreage" exceeds "irrigated acreage" by from 13,000 to 31,000 annually, while the difference between "irrigated acreage" and "cropped acreage" varies from zero to 15,600. "Irrigated acreage" on Exhibit 156 and "net cropped acreage" on 157 correspond very closely except for the years 1934 and 1936. The average of "developed farms irrigable acreage" for the ten-year period 1931-1940 is 97,905 acres. As I construe the evidence "developed farms irrigable acreage" is not the acreage actually irrigated each year, but is to some extent in excess of that value. On the other hand, the *average* acreage under irrigation may not adequately represent the acreage upon which water requirement should be determined.

Mr. Dibble testified that the derivation of his 105,000 acres was 93 per cent of the "works completed irrigable acreage", and that on a project of this kind there will in normal operation be about seven per cent of the total irrigable land which will not be calling for water at any one time.[2] Even if it be assumed that the "developed farms"

[1] R. 29284.
[2] R. 28619-22.

land has all been at some time irrigated, yet the acreage irrigated in any one year or on the average would no doubt be substantially less than the total.

It is impossible to reconcile all of the evidence on this acreage question. Taken all in all, my judgment is that it preponderates in favor of a current irrigation figure of about 98,000 acres for the Pathfinder District, including both Nebraska and Wyoming land.

Water Requirement.

The claims as to a proper acre foot per acre requirement at the land are: United States, 1.66; Wyoming, 1.7; Nebraska, 2; and Colorado, 2.

The historical deliveries, according to the project history, were:

1928	1.95	1933	2.07
1929	2	1937	1.43
1930	1.69	1938	1.69
1931	1.55	1939	1.44
1932	2.13		

Average, 1920-1929, 1.86

Average, 1930-1933 and 1937-1939, 1.71[1]

These rates of delivery were based upon "developed farms irrigable acreage". If the conclusion heretofore drawn is correct that this acreage is in excess of actually irrigated acreage, then the delivery rate in relation to the latter would be in excess of the figures above.

There seems to be rather general agreement that the requirement for Interstate should be at least slightly above

[1]R. 29036, 29231-6.

that for the Ft. Laramie on account of the differences in soil between the north and south sides of the river. Such a difference is reflected in the historical deliveries, which for the period 1920 to 1929 averaged for the Interstate 1.86 and for Ft. Laramie 1.58,[1] and for the years 1921 to 1940 (omitting 1923) were for Interstate 1.61 and for Ft. Laramie 1.46. This indicates a differential of between .15 and .28.

Mr. Meeker explained that his proposed rate of 2.0 was based upon a study of the deliveries of water to the land of the Pathfinder Irrigation District since 1928, "giving due consideration to the effect of the low water years".[2] He was referring apparently to the exclusion of the years 1934, 1935, 1936, and 1940, as in the case of Nebraska's Exhibit 626.

The United States figure 1.66 is based on the average historical deliveries for the years 1930-1933 and 1937-1939.[3] This is slightly under the actual average for these years, which, as noted above, was 1.71.

Wyoming again points out that the long-time mean annual precipitation average for Ft. Laramie, Scottsbluff, and Bridgeport is 15.57 inches and for May-September 9.87 inches, which, if added to 20 inches of irrigation supply, would total 35.57 and 29.87 inches, respectively. In that connection attention was called to the testimony of Professor J. C. Russell, witness for Nebraska, that 29 inches of annual precipitation occurring fifty per cent of the time would be adequate for crop production in this area.[4]

A proper rate, I think, is either 1.75 or 1.8. While the latter would appear to be on the liberal side, it would bear about the proper relation to the figure of 1.65 already assigned to the Ft. Laramie, and will be adopted.

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[1] R. 29229-32; U. S.-266.
[2] R. 26269.
[3] R. 28688-9.
[4] R. 1106-7.

Canal Losses.

The losses of this canal are the subject of conflicting evidence and much dispute. The various claims of the parties are:

Nebraska:	55% for Pathfinder District and 45% for Lingle and Hill.
Wyoming:	57% for Pathfinder District and 55% for entire Interstate Canal.
United States:	61.6% for Pathfinder District.
Colorado:	55% for Pathfinder District and 45% for Lingle and Hill.

The Nebraska figures are apparently based on the 1930-1933 and 1937-1939 average. Nebraska's Exhibit 625 shows the losses of the canal system for the thirteen years 1928 to 1940 (all subsequent to the commencement of operation of the Guernsey Reservoir) to average 55.8 per cent. These figures were taken from the annual reports of the Pathfinder District, which United States argues are not properly in evidence.

The Wyoming figure of 55 per cent is based upon the 1921-1940 average, omitting 1934, 1935, and 1940.[1] Mr. Nelson expects a reduction in these losses in the future.[2]

United States 61.6 per cent is based upon 1930-1940, excluding 1934, 1935, 1936, and 1940.[3]

Wyoming computes the loss percentage on Pathfinder Irrigation District alone (based upon the same years used in arriving at 55 per cent for the entire canal) and arrives at 57 per cent. This computation did not take into account the diminution of 32,167 acre feet in the storage water in the

[1] W-160-A.
[2] R. 27443.
[3] U. S.-266.

inland reservoirs during the period.[1] Mr. Nelson thought the reservoir losses were sometimes included in the canal losses in the project history, but not within the last decade ending in 1940. Assuming the reservoir losses not to have been included in the canal losses, their inclusion would increase the loss average over the period about 8/10ths of one per cent. This correction would raise Wyoming's figure upon the Pathfinder District alone to 57.8 per cent.

The historical loss for the seven years used on U. S. Exhibit 266 was 63.1 per cent. Wyoming points out that whereas Mr. Dibble suggested as proper deductions from this 63.1 per cent, one and one-half per cent on account of excess diversions in 1932 and 1933,[2] and another one and one-half per cent because of expected future improvement in losses,[3] he actually made but one deduction, and that with a deduction of the entire three per cent the United States loss factor would become 60.1 per cent.

If for the seven years used by the United States in arriving at a loss percentage of 63.1, there be taken an unweighted average of the figures appearing on Nebraska's Exhibit 625 for the same years, the result is 54.1 per cent, in contrast with the 63.1 per cent. This difference apparently arises in the main from a disparity between the Pathfinder District reports and the project history data.

Mr. Parry, testifying in 1939, said with respect to the Interstate Canal losses generally:

> "Our average loss for last year was about 51 per cent and during the short water year in 1935 I think it ran up to better than 60 per cent, but it will always run from, I would say, around 48 to 55 per cent project loss."

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[1] R. 29451-2.
[2] R. 29439.
[3] R. 29287.

He said the loss was pretty equally divided between the main canal and the laterals, with a little more than one-half in the main canal.[1]

For the Pathfinder District a loss factor of 58 per cent should be adequate. Any error in this figure would, I think, be on the upper rather than the lower side. As to Lingle and Hill there is greater uncertainty. My conclusion is for a rate of 46 per cent. To supply 1.8 at the land would require a headgate diversion rate for the Pathfinder District of 4.28 and for Lingle and Hill 3.33. Total diversions would be for Pathfinder 419,000 acre feet per annum, and for Lingle and Hill 46,000 acre feet per season. The second feet limitations would be 1,400 and 197, respectively.

Silt Deposits in Guernsey Reservoir.

A possible factor, much discussed, in the heavy transmission losses of the Interstate Canal is the desilting of water in its passage through the Guernsey Reservoir. This is something that affects other canals also, but it has been particularly stressed in connection with the Interstate.

The accumulation of silt in Guernsey has been of large proportions. Between 1929 and 1941 there was a deposit of 30 feet (28409),[2] which would represent an average rate of accumulation of 28 inches a year. This naturally has had an effect on the silt content of the water leaving the reservoir. Normally silt tends to accumulate on the bottom and walls of canals and acts as a sealing agent, reducing percolation of the water in its passage through the canal. That

[1] R. 15512.
[2] From this point on references to pages of the record and to exhibits will be made by insertions in parentheses in the text instead of by use of foot notes.

this would have some effect on losses in the canals conveying this water stands to reason.

The main source of the silt is the tributaries below Pathfinder, and particularly the early season flows of these streams. Mr. Meeker believes this effect to be very pronounced, and it has largely affected his opinion as to the headgate requirement of the project and State Line Canals. J. A. Keimig, engineer and witness for the United States, is of the opinion that the retention of silt in Guernsey will be less in the future than in the past. In 1931 the silt bed in the reservoir had risen to within seven feet of the power intake sill, and it was Mr. Keimig's conclusion that as its level approaches the sill of the outlet works all of it will be swept through the reservoir by the flow of water, and that the time will come when silt will be discharged even when only clear water is entering the reservoir (28409-16, 28781-9; U. S.-239, 240). Mr. Patterson thought the effect of the silting was only temporary and that an adjustment would take place (25221, 29337). Mr. Nelson considered that the silt problem is a thing of the past (27860). Mr. Parry said there was one advantage in having silt in the reservoir in that when the water runs low in the summer, then "we get silty water which we wouldn't otherwise get" (15485-6). He added that they received about two per cent additional water from the headgate diversions when the canal silts up for a few days (15513-4). This evidently refers to a partial and temporary silting of the canal. Mr. Dibble doubted that the deposit of silt in the reservoir had any direct effect on canal losses. He thought that the increased losses coincident with the commencement of operation of the Guernsey Reservoir were more likely due to the fact that the canal was cleaned or enlarged and excavated on one side, remov-

ing the siltation that had occurred up to that time, and that the subsequent resilting was slowed by the deposits in the reservoir. It was his opinion that a large amount of so-called silt deposited is more sand than silt and that sand does very little good in the sealing of a canal; that the effective material is a very fine material that settles least rapidly in the water. He expected the condition to gradually clear itself (29225-6). Regardless of interceptions at Guernsey, the silt content of water is less at times of low than in times of high run-offs (26483). Generally the per cent of loss in canals and laterals is greater during dry years than during wet years (29244).

There was testimony tending to show that the high transportation loss on the Interstate was due to causes other than the lack of silt, such as intermittent operation, growth of weeds, presence of scours, etc.; that the losses are recognized as being excessive; and that they will be favorably affected by remedial measures being taken, such as concrete lining of laterals, treatment with a sand bentonite mixture, filling scours, treatment with rock and gravel, and the like (29235-56).

Under all the circumstances, while it seems probable that the canal losses can and may be reduced and that some further loss in the capacity of Guernsey may occur, yet whether either will occur and to what extent appears too uncertain and speculative to permit any attempt at present evaluation. I see no alternative but to determine the canal losses on the historical basis and leave to the future any adjustment required by developments that cannot now be safely predicted.

WYOMING PRIVATE CANALS
(Other than Lingle and Hill)

For this entire group of ten canals, Wyoming and the United States say the headgate diversion rate should be 2.67 acre feet per acre. Nebraska says three acre feet per acre, and estimates canal losses at 40 per cent. (N-631) Colorado agrees with Nebraska's diversion rate, and Wyoming agrees with the loss rate. There is no direct evidence as to what the losses have been in fact. A 2.67 diversion with a 40 per cent loss would deliver 1.6 at the land. This would compare with the proposed 1.65 for the Ft. Laramie and 1.8 for the Interstate. There may be some justification for a slightly lower delivery rate for the private canals in the fact that they are somewhat lower lying and closer to the river. There is no evidence as to that, and none of the parties have suggested that there should be any difference in rate. Whether there is any difference between the requirements of the private canals on the north side and those on the south side of the river similar to that indicated by testimony as to the Ft. Laramie and Interstate is also open. The 40 per cent loss factor is not well established, and there is therefore some uncertainty as to the proper relation between the diversion rate and the delivery rate. Under the circumstances, I think a diversion rate of 2.67 should be adopted. This leaves the question of acreages. Wyoming suggests that there need be no determination of acreages since Nebraska concedes a greater total diversion requirement than claimed by Wyoming. But it affirmatively appears that the concession by Nebraska results from an assumption of an excessive diversion requirement. In any event, in order that proper consideration may be given to

priorities, the acreage entitled to water under each canal must be ascertained. I have therefore reviewed the evidence on acreage and will list the acreages found, but will discuss the evidence only in relation to the canals in serious dispute.

Canals, and Acreages Irrigated:

Burbank	312
Lucerne	4221
Grattan	1323
Rock Ranch	3072
Torrington	2061
North Platte	3153
Curtis	0
Narrows	110
Pratt and Ferris	1200
French (Wyoming land)	651
Total	16103

ROCK RANCH CANAL.

There are two priorities, one of 1884 for 2595 acres and one of 1910 for 970.6 acres, making a total of 3565.6 acres (15966). Of the land under the 1884 priority there is presently irrigated not to exceed 2250 acres (15975). There was an indefinite reference to some additional land that at times received some water, but I infer that any such could not be regarded as current demand acreage. This requires a deduction from the "adjudicated" acreage of 345 acres. From the total of 970.6 acres under the 1910 right, there should be deducted as nonirrigated two 20-acre tracts (16011), 35 acres (16007), and 13, 28, 23, and 10 acres (16013-5), or a total of 149 acres. This leaves under the

1910 right 822 acres, which added to the 1884 net acreage gives a total of 3,072 acres.

The 1910 land has a Warren Act contract (15975-6; W-29). By reference to Wyoming's Exhibit 29 it appears that the Warren Act contract covers only 954 acres or 16.6 acres less than the total 1910 appropriation.

TORRINGTON CANAL.

Priority is November 28, 1891, for 34.88 second feet covering 2,447 acres, as claimed by Wyoming.

A witness thought that during the last five years water has been applied on every forty except one in Section 33 (15900). There are a number of blown-over tracts which cannot now be irrigated (15902-3), and there are some portions too high in one section and some pasture land not regularly irrigated in another section (15904). Tracts of the following acreages are excluded from irrigation, as appears from the testimony on the pages listed: 13 acres (15921); 19 acres (15922-7); 57 acres (15928); 3 acres (15929-30); 100 acres (15931-2); 12 acres (15936); 2 acres (Id.); 20 acres (15938); 20 acres (15939); 30 acres (15940); 20 acres (Id.); 22 acres (Id.); 22 acres (15942); 13 acres (15943); 40 acres (15944), and 15 acres (15946).

The total of these deductions is 386 acres. There is another very questionable 40 to 50 acres (15932-5). Deducting 386 acres from 2,447 acres as claimed leaves a balance of 2,061 acres.

NORTH PLATTE CANAL.

Priority is September 22, 1883, for 53.38 second feet, for which Wyoming claims 3,739 acres. Shares are out

representing 3,739 acres, all subject to operation and maintenance charges (15807-8, 15838-9). The owner of a share who pays operation and maintenance is entitled to irrigation water for 40 acres (15839). Only one tract failed to pay operation and maintenance for 1938 and 1939; that is the "Putney" land in Section 6. "Most of" the land is irrigated except the Putney land (15840-4). The Putney land has two shares, representing 80 acres, for which the last payment of operation and maintenance and the last delivery of water was in 1936 (15851).

The largest questionable unit is the so-called Parker Ranch owned by E. A. Collins, who testified. The ranch consists of 640 acres, all in Section 19 except 80 acres in Section 30. About 300 acres, Collins said, can be irrigated. He later said that about 500 acres are irrigable. About 210 acres were irrigated in 1938 and 1939. The remainder of the irrigable land is being prepared for irrigation (15809-12). The 200 acres irrigated are in the North Half of Section 19 (15817). None of the South Half of Section 19 is irrigated "never any more than only just running water out there the last couple of years to irrigate the pasture" (15817). There are twenty-five acres above the Ferris Ditch (in Northwest of Northeast) that are not irrigable (15816-9). Also twenty-five acres in the Southeast of the Northeast (15819-20). None of the land in the Southeast Quarter has ever been irrigated. (This is referred to in the record as being in Section "9", evidently a typographical error for 19.) It is only in the last two years that the South Half has been irrigated for pasture. From the testimony just noted, it would appear that this was confined to the Southwest Quarter. About half of the Southwest of the Northeast is irrigated. Collins thinks he

has a water right for 590 acres (15822). This was in answer to a question as to Section 19. Does this include the portion of the Parker Ranch in Section 30, and does this represent the entire adjudicated acreage, or is there a full section in the adjudication? I am doubtful, but will assume that 590 acres represent the Parker Ranch land in the adjudication and that 370 acres (including irrigated pasture) are or will presently be irrigated, leaving a deduction of 220 acres.

160 acres in the Southeast Quarter of Section 9 are out (15820). In the South Half of Section 14, 246 acres have a water right. 210 acres are now being irrigated, and there is no testimony that any more will be irrigated in the near future (15826-7). Deduction, 36 acres. There are about 100 acres in Sections 1 and 2 of 24-62 down in the timber along the river bank that have never been irrigated (15863-5). There are probably about 40 acres out of the East Half of the Southeast Quarter of Section 7 that should be eliminated. The testimony is indefinite (15867-9). About half the golf course in Section 17 is irrigated. The exact acreage of the nonirrigated portions is not shown, but is probably around 30 acres (15885-8).

The total of the eliminations enumerated is 586 acres. Deducting this from the total right acreage of 3,739 leaves a remainder of 3,153 acres.

PRATT AND FERRIS CANAL.

(Sometimes known as Ferris No. 1 Canal)

The adjudication for this canal was for 22.01 second feet, with a priority of May 22, 1886, for 1655 acres (15698; 15703). At the ratio of one to seventy, 22.01 second feet

would serve 1540.7 acres. Wyoming claims the full acreage. United States concedes the acreage claimed by Wyoming, but assigns to the canal a priority of 1928. Nebraska takes the position that the canal has been abandoned and makes no allowance for it. (N-621) This appropriation involves an important principle on the question of abandonment and requires some special attention.

The testimony indicates that the canal was used from the spring of 1895 until 1910 or 1911 (15784-5). Other testimony indicates its possible use in 1912 or 1913 or even up to 1914 (15780-1). In 1914 a lease was taken of the land under the canal by one Ben Smith, who used it for a cattle pasture from 1914 to 1927 (15766). In 1914 there were no diversion works, and no effort was made to keep up the canal between 1914 and 1927 (15773). There was no intentional irrigation during the occupancy by Mr. Smith, although there were five or six years of high water in the river when the water came through the ditch to a point east of the Parker Ranch in Section 19, and then spilled out over 300 or 400 acres of pasture. These flows lasted from one day to two weeks in the spring. (15768-9, 15777) Four or five times about 800 acres were submerged by an overflow of water from the river (15772). These floods furnished the only water received by the land until the construction of the Arnold Drain in 1919 or 1920 (15773-4). After the Arnold Drain was constructed there was some water in the lower end of the ditch (15785). In 1928 the portion of the ditch below the dr.'n was cleaned out, and in 1934 or 1935 it was cleaned up to the river headgate. The first water from the river, since 1914, was in 1935, and from that year on the water continued to be taken from the river. (15708) This covered the years 1936, 1937, and

1938, the testimony being taken in May of 1939 (15708). John Heinz, part owner, had lived on the land since the spring of 1928. He testified that 1655 or more acres are being irrigated, (15706, 15709). This consists of 375 acres of crop land, 1,000 to 1,200 acres of native hay, and the balance of pasture, which is irrigated spring and fall (15709-11). There was not enough water to irrigate all of the land prior to 1935. Since 1935 the full appropriation has been available. (15712-3) During the off seasons some water has been applied to other land than the 1655 acres, aggregating 800 to 900 acres (15718-9). Water is now being taken both from the river and from the Arnold Drain, but just how much from each does not appear. The water from the Arnold Drain varies anywhere from 3 second feet up to 18 or 20 second feet. Since 1935 the full amount of the appropriation has been available from the river. (15712-3)

From all the evidence it clearly appears that this canal was wholly out of use from about 1911 to 1928, and continued out of use until 1935 or 1936, except for such water as was obtained from the Arnold Drain. Why it fell into disuse and remained idle during all of this time is not explained.

Wyoming argues that Nebraska may not question the priority of the canal for the reason that the Wyoming priorities, as shown by its records, were admitted by Nebraska, referring particularly to Nebraska's Exhibits 91, 92, and 93, and the record at page 15700. The record does not appear to bear out this claim. Nebraska's Exhibits 91, 92, and 93 were offered with the express reservation that Nebraska did not admit the correctness of the record as to priority dates. (418)

Nebraska contends that the priority date for the Arnold Drain water is 1928 and for the river supply is 1935. United States agrees with Nebraska that there was an abandonment in 1910 or 1911 up to 1928, but proposes a 1928 priority for the entire 1655 acres on the ground that substantially that entire acreage lies east of the Arnold Drain and was irrigable from the drain beginning in 1928.

These contentions suggest the question: If there was a loss of the water rights by legal abandonment, how can it be held that the mere renewal of use operated to give the land owner a new appropriative right with a priority as of the later date? Can an appropriation be effected without compliance with the statutory procedure?

There are a number of projects in Wyoming and Nebraska involving similar questions of abandonment. In this general area there are the Wheatland Project in Wyoming and the Tri-State Canal supplying the Farmers Irrigation District in Nebraska. The Ferris Canal case, in some of its aspects, appears more extreme than Wheatland or the Tri-State, but the difference may be one of degree rather than of principle. All of these cases must be treated consistently. With some doubt as to being right from an intrastate standpoint, I am for the purpose of interstate apportionment going to consider these claims of abandonment invalid whenever three conditions are present: (1) An original perfected appropriation and use; (2) absence of any judicial or administrative adjudication of abandonment; (3) a resumption of use, under claim of the original right, and a continuation of that use over a considerable period up to the present time, all with the approval of the Water Administration of the State in question and with a recognition by it of the survival of the original

priority. The Pratt and Ferris Canal appears to satisfy these conditions. It will therefore be assigned a priority date of May 22, 1886.

There are two other difficulties: First, the question of acreage irrigated. Although Mr. Heinz gave the testimony before referred to, to the effect that he has been irrigating 1655 acres or more, it later developed on cross-examination that this may have included land not within the appropriation, and that the only way of telling how much of the 1655 acres irrigated was within the certificate would be to have an engineer go over and check the acreage, and that this had not been done. (15747) The following tracts Mr. Heinz admitted had not been irrigated: 10 acres, 40 acres (15735); 60 acres, 57 acres (15737-8); 70 acres (15740-1); total 237 acres. Deducting this total from 1655 would leave 1418. There are 2768 acres in the Pratt and Ferris Ranch (15718). There are from 800 to 900 acres outside of the appropriation which could be watered from the ditch. How much was irrigated Mr. Heinz could not say because water was used on these lands in the off season. (15718-9) There is a question as to how much of this 800 or 900 acres is included in the total of 1655 irrigated. Not more than 1200 acres has been substantiated as representing present demand acreage. A second difficulty is the question of how much of the demand for this canal is satisfied from the river and how much from the Arnold Drain. The water running in this drain is seepage from the Hill Irrigation Project, but there is no way of telling how much is used. (15760-2) Giving Wyoming the benefit of the doubt, a requirement of 3204 acre feet per season will be assigned. This, at the 2.67 rate, would supply 1200 acres.

FRENCH CANAL.

There was a stipulation between Wyoming, Nebraska, and Colorado for this canal, covering priority date, extent of appropriation, and acreages (12358). The United States was not a party but does not question the facts as stipulated. The priorities, quantities, and acreages stipulated were as follows:

For Nebraska:

December 21, 1911	11	second feet,	770 acres
September 11, 1915	3	second feet,	213 acres
March 20, 1920	.6	second foot,	42 acres

For Wyoming:

February 20, 1911	7.2	second feet,	504 acres
July 14, 1915	2.10	second feet,	147 acres

Applying the diversion rate of 2.67 to the acreages found for the Wyoming private canals gives the following diversions in acre feet:

Burbank	833
Lucerne	11270
Grattan	3532
Rock Ranch	8202
Torrington	5503
North Platte	8418
Narrows	294
Pratt & Ferris	3204
French	4475
Total	45731

STATE LINE CANALS.

There are four so-called State Line Canals, viz., the Mitchell, with headgate in Wyoming about a mile above the Nebraska state line; the Gering, with headgate just below the state line; the Tri-State, with headgate about a mile below the state line, and the Ramshorn, which receives its supply from the Tri-State. There is also the Northport, a North Platte Project canal, water for which is carried by the Tri-State. It is sometimes referred to as a State Line Canal but is not so treated herein.

MITCHELL CANAL.

The Mitchell Canal joins with the Gering about two and one-half miles below the state line and terminates at what is known as the Bad Lands Gauging Station. At this point the Mitchell land terminates and the Gering System begins. The length of the Mitchell from its headgate to the Bad Lands Station is about 30 miles (11090, 11203). The appropriation is for 194.29 second feet, covering 13,633 acres, with a priority date of June 20, 1890 (11203, 12312, 12348). Wyoming stated, "We do not dispute any of the claims" (12347), and agreed "that there is presently existing all of the rights covered by the certificate" (12348). In its brief Wyoming says: "Under this stipulation the full adjudicated acreage is conceded." Colorado's acquiescence was qualified (12348), but there is an apparent concession in her brief of 13,633 acres. United States makes no issue on the point of acreage, although questioning its accuracy. This, therefore, will be taken as the irrigated acreage.

On the question of water rate requirement, there is no direct evidence except certain testimony given in reference to the Gering Canal. A comparison with other canals can be drawn. Of those already considered the Wyoming private canals are most comparable. On a dearth of evidence as to them, a diversion rate of 2.67 was adopted. Nebraska proposes three acre feet per acre for the Mitchell. Wyoming and the United States urge 2.5 acre feet per acre. United States justifies a higher rate for the Wyoming canals on the ground that they, but not the Mitchell, have a sandy, gravelly soil, which makes for higher canal losses. This is supported by considerable testimony, particularly as to the Wyoming canals on the north side of the river. Following are the references: Pratt and Ferris (15716, 15796), North Platte (15852), Torrington (15912), Rock Ranch (15973), Grattan (16109), Burbank (16152), and Lucerne (16195).

There is no evidence one way or the other as to character of soil under the Mitchell, except some general evidence of a trend towards heavier soil passing from west to east in this area, and a passing reference about to be mentioned. The Mitchell is on the south side of the river, which generally has more compact soil than the north side. There is probably some advantage in the fact that the Mitchell canal also transports water for the Gering. In the case of the Gering there was testimony by Mr. Sands that the normal natural loss of Gering water in transit through the Mitchell Canal is not more than ten year cent, but he also said, "They claim that it runs from 15 to 40 per cent in seepage and evaporation." (11121-2) He testified that the lands in the Gering district are not underlaid with gravel, and that the rate of loss from the point where the water

is delivered to Gering is rather low, but it is carried through the Mitchell district, "which runs to a different type of soil" (11123-4). This suggests that there is some gravel in the Mitchell subsoil. The Mitchell has greater length than most of the Wyoming private canals.

The historical diversion for the Mitchell from 1928 to and including 1933 exceeded three acre feet per acre each year except that 1929 was 2.97 and 1932 appears not to be published in the Nebraska Biennial. Beginning with 1933 and 1934, large October-April diversions appear. The May-September diversions 1933 to 1940 were as follows:

1933.....3.31	1937.....3.08
1934.....2.53	1938.....2.57
1935.....1.53	1939.....2.26
1936.....2.25	1940.....1.16

The mean May-September diversions for the ten-year period 1931-1940 were 34,450 and the mean annual 41,120. The 1930-1933 and 1937-1939 mean May-September was 41,951 (W-86-89, 93-94, 144, 146).

For this canal I think a diversion rate of 2.57 would best reflect the evidence. Applied to 13,633 acres, this produces a total of 35,036 acre feet.

GERING CANAL.

This canal has a priority of March 15, 1897, for 204.56 second feet, covering 14,318.92 acres (N-620, 622). Nebraska claims three acre feet per acre headgate for 14,319 acres, or a total of 42,957 acre feet (N-631). A footnote on this exhibit reads: "Warren Act contract for 35,500 A. F. increase 7,457 A. F. due to clear water." This does not,

however, appear to be the method by which the quantity specified was originally arrived at. Rather the basis was a delivery of 1.8 at the land with an estimated loss of 40 per cent. Of this allotment Mr. Meeker said: "That is an arbitrary figure; it is not based on refinement." (26273).

Nebraska's Exhibit 497, the assessment roll for 1937, purports to show the "acres irrigated" to be 14,232.49, and on page 22 gives a summary of acreages from 1929 to 1937, inclusive. The average for the eight-year period is computed to be 14,222. Mr. Weatherfield, director and manager of the project, testified generally that water was delivered to all of the lands assessed (11169-70). He elsewhere refers in general terms to "the 14,000 acres that we irrigated" (11169). The 1937 acreage of 14,232.49 is the largest since 1930. There are 378 acres carried on the assessment roll that have not been irrigated since at least 1928 or 1929 (11247-9). Deducting this from the 1937 assessment acreage would leave 13,854.49. Mr. Sands, who had no official connection with the district at the time of his testimony and who was a witness primarily as to the early history of the canal, but who was a water user and seemed rather familiar with the general situation, testified that the irrigated acreage was about 13,500 (11105, 11088).

Mr. Grimm, secretary, treasurer, and assessor of the district, testified to a unique practice, according to which only lands assessed at $20.00 per acre (this being the maximum) received a full supply of water. Land assessed under $20.00 per acre was supplied according to its value. For example, land assessed at $10.00 per acre received only one-half the supply received by land assessed at $20.00 per acre (11244-46, 11251-54). Wyoming computes from

Nebraska's Exhibit 497 that there were 2606 acres assessed at less than $20.00 per acre and that in 1937 there were 378 acres in suspension for nonpayment of assessment. Mr. Grimm, in answer to a question as to how the variations in value which controlled the supply were arrived at, said: "Oh, real value of the land takes into consideration seepage, hills, and things of that character that make it nonirrigable." (11139, and see 11254) This suggests that the reduction in value, assessment, and supply is actually to compensate for nonirrigated acreage carried on the assessment roll, and that the actually irrigated acreage is substantially below the "acres irrigated" shown on the roll. Mr. Weatherfield himself, while paying assessment on 127.76 acres and receiving full delivery for that acreage, actually irrigated only 115 acres (11257). In answer to a question as to whether the supposition was that all of the undervalued land was irrigated, he said, "Irrigable at least," and added "Irrigable, whether irrigated or not". The conclusion of Wyoming I believe is warranted that not more than 13,500 acres are actually irrigated currently under this canal.

The evidence as to canal losses is very fragmentary, consisting mainly of the testimony already referred to in connection with the Mitchell Canal. Mr. Sands testified that the percentage of loss was comparatively low from the point where water was delivered to the district. (11234-5) Mr. Willis[1] testified that there was a lot of seepage that comes down from the Ft. Laramie Canal that helps out the Gering District. (3610) This may reduce or compensate for some of the loss. The pick-up of silt by the river between Whalen and the Nebraska line may have some effect on the losses of all of the State Line Canals (28417).

[1]Robert H. Willis, Chief of Nebraska Bureau of Irrigation.

The length of the Gering is 55 per cent of the combined Mitchell-Gering Canals (11188). Although the two canals irrigated comparable areas, the annual and also the May-September diversions of the Gering averaged about 6,000 acre feet a year under those of the Mitchell for the 1931-1940 period (W-146). Nebraska suggests the same diversion rate (3 a. f. a.) for the Mitchell and the Gering. It would seem that the Gering rate should be at least slightly higher unless the greater length of its canal is offset by lower requirement at the land due to a difference in soil. I am assigning to the Gering a diversion rate of 2.67, as compared with 2.57 for the Mitchell. If 40 per cent is a proper estimate of loss for the Ft. Laramie, 35 per cent should cover the loss of the Gering. A delivery of 65 per cent of 2.67 would net 1.7 at the land. 2.67 x 13,500 equals 36,045,—say 36,000. This is 8,000 in excess of the May-September average for 1931-1940 and 500 in excess of the Warren Act contract amount. It is, however, 1,692 acre feet below the May-September average for the seven years 1930-1933 and 1937-1939.[1] In four of the seven years the delivery amounted to more than three acre feet per acre for 13,500 acres, and in three years it fell below 2.67.

NORTHPORT CANAL.

The Northport is a North Platte Project Canal. The water for the canal is, under contract with the United States, carried by the Tri-State Canal a distance of 80 miles to the Red Willow rating flume, where it is delivered to the Northport District. It has a priority of

[1]Computed from Wyoming's Exhibits 86-89, 93, 94, 144.

December 6, 1904 for 230 second feet for 16,109 acres (N-620; 27698). There is little evidence as to the acreage actually irrigated, but there is substantial agreement on 13,000 acres.

There is no direct evidence as to losses. Both Mr. Meeker and Mr. Nelson testified that they understood that the loss charged to transmission between the Tri-State headgate and Red Willow was 30 per cent. Mr. Nelson thought this was about right and that it was substantiated by the Nebraska Biennial Reports. United States does not estimate the losses, but bases its requirement on the May-September average delivery for the years 1930-1933 and 1937-1939 (U. S.-269; 28651). By comparison of headgate diversions with deliveries at Red Willow, Wyoming computes the actual losses on this section to be 27.5 per cent, and suggests a total loss factor of 57.5 as compared with 55 per cent proposed by Nebraska. Assuming the loss from Tri-State headgate to Red Willow to be 27.5 to 30 per cent, Wyoming's 57.5 would allow a further loss of 27.5 to 30 per cent for transmission and distribution from Red Willow. It would hardly seem possible that any injustice could be done the canal by the adoption of this factor. This compares with a figure of 58 per cent adopted for the Pathfinder Irrigation District. While the Northport water naturally suffers a greater main canal loss because of longer transportation, the lateral losses must be much lower. This is equally important. According to Mr. Parry, approximately one-half of the Pathfinder losses occur in the laterals. With a delivery rate of 42.5, a headgate of 4.2 will deliver approximately 1.8 at the land. The headgate rate of 4.2 applied to 13,000 acres gives a total annual diversion of 54,600 acre feet. This corresponds

almost exactly with the 1930-1933 and 1937-1939 May-September average as computed from the Wyoming exhibits. The annual average is but slightly more. Nebraska, however, computes an "approximate only" average for 1930, 1931, 1932, and 1933 from Nebraska Biennials of 59,000 acre feet. Mr. Dibble, for the seven-year period, derives from the project history a May-September average of 60,000 acre feet. According to the Wyoming exhibits there were only two years in the eleven-year period from 1929 to 1939 in which the diversions equalled 60,000 acre feet. These were 1933 with 77,416 and 1937 with 62,632. For 13,000 acre feet the 1933 diversion would supply almost six acre feet per acre at the headgate. For 13,000 acre feet the United States proposed 60,000 acre feet would call for a headgate diversion of 4.61.

The exceedingly wide fluctuation in the delivery of water to this project (as well as to a great many others) seriously discredits those deliveries as a measure of requirement. This is true whether we look to the maximum or minimum or to an average. A more reliable method, wherever the record supplies the necessary data, is to start with the per acre requirement at the land, ascertain and apply the canal loss percentage, and thus arrive at the necessary rate of headgate diversion.

The determined diversion rate is 2.6 acre feet per acre.

TRI-STATE CANAL.

(Farmers Irrigation District)

There are two claims of appropriation, one with a priority of September 16, 1887 for 868.89 second feet, covering 60,822.2 acres, the other with a priority of April 14, 1902, of 32.6 second feet, covering 2,244 acres (N-620, 622).

The allowances contended for are:

Nebraska:	60,000 acres, 1.8 a.f.a. at land, 55 per cent canal loss, 4 a.f.a. diversion rate, 240,000 a.f., total annual diversion;
Wyoming:	49,000 acres, 1.7 a.f.a. at land, 45 per cent canal loss, 3.1 a.f.a. diversion rate, 151,900 total annual diversion;
Colorado:	48,900 acres, 1.8 a.f.a. at land, 55 per cent canal loss, 4 a.f.a. diversion rate, 195,600 total annual diversion;
United States:	55,000 acres,* 1.8 a.f.a. at land, 50 per cent canal loss,** 3.6 a.f.a. diversion rate, 200,000 total annual diversion***.

(N-631, W-161, U. S.-269; 24952).

Priority.

Wyoming contests the priority dates, both on the basis of the extent of the original appropriation and on the ground of subsequent abandonment.

First as to priority dates. The appropriation was initiated by the posting of notice on September 16, 1887 (filed with the County Clerk September 19, 1887) (N-469; 5414), designating a quantity of water sufficient to fill a canal forty feet wide at the bottom and conveying water to the depth of four feet. Without specification of pitch and grade, this notice is indefinite as to delivery capacity of the canal. The notice was given prior to the enactment of the first irrigation statute in Nebraska, that of 1889, and at a time when the basis of irrigation law in that State was upon the idea "that any person or individual may appropriate surplus waters which have not theretofore been

* Absolute maximum.
** Safe maximum.
*** Maximum, 180,000 a. f. minimum.

appropriated and use the same to irrigate such land as he may see fit." (*State v. Mitchell Irrigation District*, 129 Neb. 586, 262 N. W. 543, 545; *Farmers Irrigation District v. Frank*, 72 Neb. 136, 100 N. W. 286) Another notice of appropriation was given November 17, 1890 (filed November 18, 1890) (N-470) for the appropriation of an additional 200,000 miner inches (the equivalent of about 4,000 second feet). This notice designates the point of diversion as being that of the previous Farmers Canal Company headgate, and describes the canal as "an enlargement of the ditch heretofore constructed", and specifies the dimensions and grade of the enlarged canal (N-470; 5424-5). There was a third notice dated February 26, 1895, of an additional appropriation of 275,000 miner inches. This appears to have been recorded March 14, 1895 (N-471).

Work was commenced on the canal in the spring of 1888 (9876-7, 10092). By the spring of 1890 water ran in the canal at least nine miles below the headgate, and there was some irrigation (9879-80). In December, 1890, or early 1891, the stock of the Farmers Canal Company was acquired by the so-called Wright group, in payment for which perpetual preference water rights were given to the former owners of the stock. There were 57 such rights, each representing a forty-acre tract. (10067-69) Work continued on the canal with some continuity until June, 1893, at which time there was about twenty miles of continuous canal completed to a width of 30 feet, except for the first two miles, which were 100 feet wide and 60 feet wide respectively (10030-32, 9976-7). After June, 1893, some inconsequential token work continued for about a year and then all work ceased until the fall of 1904 or 1905 (10048-9, 10061-2). After resumption, probably in 1905,

the work proceeded to completion in the fall of 1913 (10114-6, 10071-92, 10100-40, 10181-10245, 10387-94, 10155-68).

Pursuant to Chapter 69, Laws of Nebraska of 1895, the State Board of Irrigation held an adjudication of priorities of appropriation, and on January 9, 1897, an order was entered, affirmed April 7, 1897, determining that the Farmers Canal Company had a valid appropriation for 1142-6/7ths second feet, with a priority of September 16, 1887, limited by (a) carrying capacity of the canal, (b) the requirement for beneficial use, and (c) one second foot for each 70 acres of land to which water should be applied before September 1, 1904. The limitation as to time for application of water to the land was later held invalid by the Nebraska Supreme Court. On appeal to the District Court the order of the State Board of Irrigation was reversed, but on appeal to the Supreme Court the order of the District Court was reversed and the case remanded for judgment in accordance with the order of the State Board of Irrigation. *Farmers Irrigation District v. Frank,* 72 Neb. 136, 100 N. W. 286. The decision of the Supreme Court was June 9, 1904. It not only upheld the State Board of Irrigation in its determination as to the original appropriation, but also held that there had been no subsequent loss by abandonment. The decision was subsequently in substance reaffirmed in *Enterprise Irrigation District v. Tri-State Land Company,* 92 Neb. 121, 138 N. W. 171, and *State ex rel Sorensen v. Mitchell Irrigation District,* 129 Neb. 586, 262 N. W. 543. At the time of the decision last referred to, the appropriation had apparently been reduced to 905 second feet,

Wyoming strongly contends that the original appropriation and project were designed to serve only about 2,000

acres then owned by the promoting group, and that the 1887 priority should be limited to 28.57 second feet; that in its later dimensions the project was first conceived and initiated in 1905, and that that is the proper priority date with respect to any rights beyond 28.57 second feet. Also it has been urged that any appropriation beyond this limit was abandoned by interruption in construction between 1893 or 1894 and 1905. It must be admitted that these contentions find considerable support in the record. The testimony is lengthy, the main portion on this point running from page 9868 to 10386. On the question of priority, my judgment is that the scales are turned in favor of the earlier priority by the adjudications and administrative treatment of the project in Nebraska. The history of the adjudication and court decisions has just been recited. The adjudication of the State Board of Irrigation has stood for forty-five years, and the decision in the *Frank* case sustaining the adjudication has been in force and applied for 40 years. This adjudication and decision have been the basis of the Nebraska water administration during all of the subsequent years as between the appropriators of that State. The priority was established at a time when there was no question of interstate administration on a priority basis. The adverse interests of other canals give assurance that the Tri-State claims were adequately contested and determined on their merits. While the action of the Board of Irrigation and the decisions of the Courts are not binding on other States in an interstate suit in the sense of being *res adjudicata*, yet it would seem that they, and the administrative practice in Nebraska long based on them, should at least have evidentiary weight on the issue of fact. Also it would seem proper that the question

should be considered in the light of the practice which appears to have obtained both in Wyoming and Nebraska of considering liberally in favor of the appropriator any question of sufficiency of appropriation procedure or of diligence in application of water or in dealing with claims of abandonment. In the present suit the abandonment claims of each State against the other are inconsistent with the position taken by each in respect to certain of its own projects. The claim of abandonment as to the Tri-State would be ruled out by criteria applied in the case of the Wyoming Pratt and Ferris Canal (p. 220). I shall assign to the Tri-State the 1887 priority for 905 second feet, subject to determination of acreage and beneficial use.

Acreage Irrigated.

This is also a matter of very serious controversy. There is a large volume of testimony (over 800 pages) on the subject. (10246-10381; 10395-11083). No two of the parties agree.

There are about 80 miles of main canal and 244 miles of laterals, exclusive of the farm laterals (10401). The total acreage under the canal is approximately as follows:

Within Farmer's Irrigation District	62,320 acres
Preferred rights outside of the District	3,041.3 acres
Land "set out of" the District	1,272 acres
Total	66,633.3 acres

(10398-10400) The exact figure on land within the District may be 62,335.8 (10427), which would make the grand total 66,649.1 acres. As in the case of other canals the effort will be to determine the acreage that represents the current year to year demand for water.

Mr. Meeker for Nebraska arrived at 60,000 acres by elimination of about 3,000 acres on account of poor soil and by reason of the fact that the Warren Act contract is based upon the lesser acreage. (26269)

In briefest form evidence as to acreage is found in Nebraska's Exhibit 489 and the testimony concerning it. Page 24 of the exhibit is a summary of the lands in the district under the classifications of "water delivery acreage" and "non-delivery acreage". The "nondelivery acreage" is land on which no toll is paid and to which no water is delivered (10514). As to this I believe there is no dispute, so that nondelivery acreage can be eliminated from current demand acreage. The "water delivery acreage", beginning with 1933, is subdivided into "high value", "low value", and "sub-irrigated". "High value" applies to all lands assessed at more than $1.00 per acre. "Low value" applies to $1.00 land. These two statements, however, are subject to the rule that if any $1.00 land pays toll, it is put in the "high value" column (10512-17) Since 1933 toll charges have had to be paid in advance of delivery of water. The $1.00 land (and land between $1.00 and $20.00, of which there was very little) would get water "if they pay the toll". Low value land paying the toll would automatically be placed in the high value column, and all land on which no toll was paid is carried in the low value or sub-irrigated column (10532, 10513). From this it seems clear that all land to which water has been delivered, since and including 1933, appears in the high value column. This is borne out by other testimony. On the so-called eligibility list for 1927 to 1932 (pages 25 to 42 of N-489), eligible acreage corresponds closely with the total water delivery acreage as summarized on page 24. The eligible acreage includes all

land in the farm units reported eligible for water, regardless of value, and includes $1.00 land so eligible (10675), but the "eligible acreage" is considerably in excess of the acreage actually irrigated. In 1932 the eligible acreage was 56,309.9, whereas the area served with water was approximately 50,151 (10677-8). The irrigated acres here would be under 90 per cent of the eligible acreage. Eligible acreage includes certain $1.00 land, whether irrigated or not (10680).

Referring to pages 9 to 12 of the exhibit, and particularly the footings at the bottom of page 12, all relating to the year 1937, Mr. Daggett[1] testified, as appears from the footings themselves, that the "seep" and "subject to irrigation" acreage totals 10,037.4 acres not irrigated in that year nor back to 1927, except perhaps intermittently between 1927 and 1932, presumably not since 1932 even intermittently (10654-5). This did not include 4,359.8 acres under the "H. V.", "non-delivery acreage", which presumably was not irrigated in 1937. This would make a total of 14,379.2, which subtracted from the grand total of 65,362.2 on page 24 leaves 50,965.8, which may be regarded as the maximum for 1937 and corresponds closely with the "water delivery acreage," "H. V.," on page 24. The testimony suggests that even in the "water delivery acreage", "H. V.," there is likely to be some nonirrigated land (10648, 10673). As to 1937 there was testimony as to certain nonirrigated tracts, such as railroad right of way, comprising 337 acres (Exhibit, p. 13; 10489, 10519), a part of the Bayard town lots, 60 acres (p. 14, 10520), some 394.8 acres of sub-irrigated land (p. 8; 10506-8), all of which I understand are carried in the high value delivery acreage column on page 24 of the exhibit (10816).

[1]E. O. Daggett, Manager Farmers Irrigation District.

Practically all of the $1.00 land for one reason or another is incapable of profitable irrigation. Mr. Daggett could think of an exception of only 21 acres out of the approximately 10,000 acres (10665). This land nevertheless continues to be included in the acreage reports (10655-6).

While Mr. Daggett testified that practically all of the eligible land (pages 25 to 42 of N-489) was irrigated from 1932 up to 1937, it appears that the qualification "practically" represents a substantial margin. For example, in 1932, on which comment was made above, the difference was more than 6,000 acres. The acreage for 1932 is taken from the "Ewing-Hutchins" report, which, as to the irrigated acreage, Mr. Daggett agrees is approximately correct. (10678) The irrigated acreage, therefore, was slightly less than 90 per cent of the eligible acreage. If the same percentage were applicable from 1927 to 1931, inclusive, the result for each year would be the same as for 1932, since the eligible acreage remained substantially constant during those five years. It is reasonable to suppose that the eligible acreage might be larger in relation to the irrigated acreage in the period before 1933 than in the period subsequent, since the prepayment of toll rule adopted in 1933 would be apt to operate to reduce the nonirrigated acreage which would otherwise be found in the eligible and high value water delivery columns. Mr. Daggett (testifying in February, 1938), said that the irrigated acreage had remained the same for the past eleven years (10570), but his later testimony perhaps limited this to six years (10674).

During the five years preceding 1932, both the "high value" and the "eligible" lands ran considerably higher than the corresponding values for 1932 and later. The

"high value" acreage of the years 1933 to 1937 averaged 90 per cent of the total "water delivery acreage" for those years (N-489, p. 24). Assuming "high value" acreage to be equivalent to the acreage irrigated, and assuming that prior to 1933 the percentage of "water delivery" acreage irrigated to have been the same as in the years 1933 to 1937 (viz., 90 per cent), then the "water delivery" acreages and irrigated acreages for the 11 years 1927 to 1937 were as follows:[1]

	Water Delivery Acreage	*Irrigated Acreage*
1927	60,242.5	54,200
1928	59,387.2	53,400
1929	59,575.1	53,600
1930	60,409.2	54,300
1931	58,941.8	53,000
1932	56,067.1	50,400
1933	53,606.2	48,070.5
1934	53,697.2	48,231.8
1935	53,310.6	47,903.5
1936	54,135.5	48,452.6
1937	56,796.9	50,722.2

Colorado, by an aerial photographic study, during the years 1939, 1940, and 1941 determined the Tri-State irrigated acreage to be 48,900 as "a sort of average figure for that period" (24952, 24905).

If I have correctly interpreted the evidence, the largest area irrigated in any one year during the six-year period 1932 to 1937, inclusive, was something less than 51,000 acres, and the average for the six years is something less than 49,000 acres. Prior to 1932 there is no record or direct evidence as to the extent of actual irrigation. (10674) From the indirect evidence reviewed, I think a fair infer-

[1]Computed from page 24 of Nebraska's Exhibit 489.

ence can be drawn that from 1927 to 1931, inclusive, the largest area irrigated in any one year was something less than 54,000 acres, and that the average for the five-year period was less than 53,000 acres. For the 11 years 1927 to 1937 the average was probably less than 51,000 acres. Current demand would appear liberally represented by 52,300 acres. It is necessary to allocate this between the two priorities. Of the 3,194 acres under Application 660 (1902 priority), 1,315.6 acres are listed under high value delivery acreage (N-489, pp. 20-23). The latter figure may therefore be taken as the acreage supplied with surface irrigation. In round figures the acreage under the 1902 priority may be taken to be 1,300 and under the 1887 priority 51,000.

Canal Losses.

The loss factor for this canal must be determined on opinion evidence and comparison with other canals. There are no records of water deliveries to the land and no evidence of actual or measured losses. The estimate of the engineers, as already mentioned, is 45, 50, and 55 per cent.

For the Pathfinder Irrigation District the Interstate Canal was assigned a loss factor of 58 per cent. Obviously, in view of the far greater length of the Interstate main canal and laterals, its losses must be substantially higher than those of the Tri-State. The Interstate main canal has a length of 175 miles as compared with 80 for the Tri-State, and the length of the main canal and laterals is 1,626 miles in the one case and 324 in the other (U. S. 73; N-564; 10401, 27451, 27462). The average width of the Pathfinder irrigated land is about 4.8 miles as compared with 2.6 for the Farmers Irrigation District (27463).

Mr. Nelson thought the lands under the Farmers District more compact, the soils better, and losses naturally a great deal less than in the case of the Pathfinder District (Id.) It was Mr. Meeker's opinion on the other hand that the Tri-State and Interstate soils are of the same sandy, friable character, and that the losses on the two canals are comparable (26271-5). The Tri-State does not have the Interstate off-channel reservoir losses. The Tri-State, but not the Interstate, has the benefit of some unmeasured drainage from a project above (11543). If, as has been inferred, the Northport main canal loss is between 27.5 and 30 per cent from headgate to Red Willow, clearly the Tri-State water, which in transit through its main canal covers on the average but half the distance, would suffer a loss substantially lower. The Tri-State has the benefit of some silt accretions between Guernsey and its headgate not shared by the Interstate (28417). A loss factor of 48.5 appears warranted but ample.

Diversion Rate.

The delivery rate at the land at most should not exceed that of Pathfinder District, for which 1.8 was adopted. With a loss rate of 48.5, this would call for a diversion rate of 3.5. On this basis the total diversion for the 1887 right would be 178,500 acre feet and for the 1902 right 4,500 acre feet, or a total of 183,000 acre feet. This is 3,000 acre feet above the storage water right which this canal has under its Warren Act contract. (N-531) That contract calls for delivery in second feet in accordance with a prescribed schedule, "the total amount to be so delivered being approximately 180,000 acre feet".

RAMSHORN CANAL.

This canal has a priority of March 20, 1893, for 45.71 second feet. The total present acreage in the district is 2,044.2 acres, but 214.9 of these acres are under the Tri-State right, leaving 1,829.3 acres in the Ramshorn District under the Ramshorn right. (11424-5) Probably not over 719.2 acres were irrigated in 1937 and not over 1,000 at any time in the last ten years. (11440.) There appears to be agreement on 994 as representing the present demand acreage, and on a three acre feet per acre headgate diversion, which results in a total diversion of 2,980 acre feet for the May-September period. (N-631, W-164) The Ramshorn receives its supply through the Tri-State, being diverted by the latter and spilled back into the river about a mile and a quarter above the Ramshorn headgate. This canal will, therefore, in accordance with the claim of Nebraska, have to be treated as a State Line or Tri-State Dam Canal. (11402-3). Wyoming disputes that the Ramshorn is dependent upon the Tri-State for supply, and relies upon the testimony of William M. Johnson, superintendent of Water Division No. 1 of Farmers Irrigation District (11046), who said that the Tri-State did not carry Ramshorn water (11066). However, testimony to the contrary was given by John Gibson, director and former secretary and treasurer of the Ramshorn District (11397), and by Marion E. Ball, assistant engineer for Nebraska (13339-40). The weight of the testimony appears to support Nebraska's contention.

DISTRIBUTION BY MONTHS OF SEASONAL WATER SUPPLIES, IN TERMS OF MEAN SECOND FEET FLOWS, NORTH PLATTE PROJECT AND NEBRASKA STATE LINE CANALS.

The following tabulations are those referred to on page 75, ante. First there is set out for each canal its determined seasonal requirement in acre feet; second, its maximum second feet rate as limited by statute, being one second foot for each 70 acres irrigated, and, third, the number of days of continuous flow at the specified rate necessary to yield the seasonal requirement in acre feet.[1] Then follows the mean monthly diversions in second feet for each month of the period and the averages of the means. Information as to the diversion rates is from the Biennial Reports of the Nebraska Department of Roads and Irrigation. These reports do not cover the Wyoming private canals, and they are therefore not included in the tabulations.

[1]This is the quotient obtained by division of acre feet by second feet times two.

TABLE XX

INTERSTATE CANAL

Acre Feet Requirement..... 419,000*
Second Feet Limitation..... 1,443**
Number of Days to Yield Acre Feet Requirement 145

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	1270	2064	1778	1747	371	1446
1932***						
1933	854	1827	2087	2104	1541	1683
1934	648	509	472	840	0	494
1935	316	931	1821	1738	408	1043
1936	1562	1257	1423	1404	352	1200
1937	1163	1362	1806	1920	1480	1546
1938	1121	1404	1707	1978	1301	1502
1939	1597	1300	1536	1582	599	1323
1940	875	534	881	1130	0	684
Average	1045	1243	1501	1605	672	1213

*378,000 for Pathfinder District and 46,000 for Lingle and Hill.
**Includes Lingle and Hill and Pathfinder Irrigation District minus lands irrigable with water from inland reservoirs.
***Record lacking.

TABLE XXI

FORT LARAMIE CANAL

Acre Feet Requirement.....285,177
Second Feet Limitation..... 1,481
Number of Days to Yield Acre Feet Requirement 96

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931*						
1932*						
1933	304	1236	1467	1418	1063	1098
1934	490	518	606	881	205	540
1935	0	180	1279	1161	571	638
1936	830	666	965	990	215	733
1937	331	739	1300	1460	1182	1002
1938	345	820	1420	1455	753	959
1939	1053	887	1166	1094	422	924
1940	0	574	782	833	101	458
Average	419	702	1123	1161	564	794

*Record lacking.

TABLE XXII

MITCHELL CANAL

Acre Feet Requirement.....35,000
Second Feet Limitation..... 195
Number of Days to Yield Acre Feet Requirement 90

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	116	173	191	180	135	159
1932*						
1933	46	170	181	188	165	150
1934	127	152	81	104	95	112
1935	53	24	173	95	0.1	69
1936	158	136	116	66	22	100
1937	154	126	190	170	29	134
1938	32	128	177	123	110	114
1939	147	121	77	62	102	102
1940	78.1	165	19.7	2.6	1.9	53.5
Average	101	133	134	111	73	110

*No record for Mitchell in Nebraska Biennial Report for 1932.

TABLE XXIII

GERING CANAL

Acre Feet Requirement 36,000
Second Feet Limitation 193
Number of Days to Yield Acre Feet Requirement 93

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	110	227	152	56	0	109
1932	166	217	176	144	122	165
1933	96	201	164	148	139	150
1934	80	11	69	1	0	32
1935	0	0	58	111	11	36
1936	120	118	74	84	17	83
1937	106	86	137	136	123	118
1938	127	96	128	159	48	112
1939	164	109	101	102	33	102
1940	41	69	62	75	0	49
Average	101	113	112	102	49	96

TABLE XXIV

TRI-STATE CANAL

Acre Feet Requirement..... 148,000*
Second Feet Limitation 603*
Number of Days to Yield Acre Feet Requirement 123

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	438	946	917	761	446	701
1932	171	803	919	876	732	700
1933	289	904	900	820	380	659
1934	320	621	394	84	202	324
1935	72	399	1003	650	588	542
1936	652	744	868	671	588	705
1937	474	605	820	682	324	581
1938	362	566	660	673	515	555
1939	722	540	607	563	451	577
1940	433	710	539	231	399	462
Average	393	684	763	601	462	581

*After deduction of interceptions below Tri-State Dam.

TABLE XXV

RAMSHORN CANAL

Acre Feet Requirement.....3,000
Second Feet Limitation..... 14
Number of Days to Yield Acre Feet Requirement 107

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	14	26	16	18	4	16
1932	5	12	25	25	8	15
1933	6	19	21	19	5	14
1934	3	2	2	0	1	2
1935	12	4	13	2	1	6
1936	9	10	4	4	3	6
1937	8	11	16	8	5	10
1938	5	12	15	8	11	10
1939	15	12	7	8	4	9
1940	3	12	0	2	2	4
Average	8	12	12	9	4	9

TABLE XXVI

NORTHPORT CANAL

Acre Feet Requirement..... 54,600
Second Feet Limitation..... 186
Number of Days to Yield Acre Feet Requirement 147

	Mean Monthly Diversion in Second Feet					Average of Monthly Means
	May	June	July	Aug.	Sept.	
1931	78	214	173	178	121	153
1932	166	217	176	144	122	165
1933	5	146	222	219	182	155
1934	18	136	89	31	0	55
1935	0	81	191	175	67	103
1936	74	154	202	127	25	116
1937	181	191	274	300	220	233
1938	75	209	226	282	73	173
1939	16	193	200	219	149	155
1940	0	100	136	165	0	80
Average	61	164	189	184	96	139

EVIDENCE CONCERNING THE TRI-STATE DAM—KINGSLEY RESERVOIR SECTION.

The general conclusion respecting requirements and supply for this section was stated on page 92. The following review of the evidence and claims of the parties is in support of that conclusion.

The lands claimed by Nebraska to be irrigated are shown on her Exhibit No. 620 and total 84,565 acres. The corresponding claim by Wyoming appears on her Exhibit No. 164, which shows 70,488 acres; difference, 14,077 acres. For the portion of the section between Tri-State Dam and Bridgeport the claims are Nebraska, 56,793 acres; Wyoming, 50,696 acres; difference, 6,097 acres.

The total requirement proposed by Wyoming, including diversions and interceptions, is 183,950 acre feet per season which for the acreage claimed by Wyoming would represent a diversion rate of 2.6 a.f.a. The Nebraska requirement claim is given in terms of second feet (N-620). The United States "revised requirement" average as computed from Columns 66 and 73 of United States Exhibits 271 and 275 is 238,580 acre feet, which would represent diversion rate of 3.38 on the Wyoming acreage and 2.82 on the acreage as claimed by Nebraska. The United States "revised total diversion" requirement was arrived at for the years 1931 to 1936 by adding to the historical diversions the full amount claimed by Nebraska for each canal during the time it was closed by the Nebraska Water Administration, but limited by Nebraska's Exhibit 620 and by Warren Act contracts. For the years 1930 and 1937 to 1940 there was added to the historical diversions the average of the increases found for the years 1931-1936, subject to the same

total limitations. (28739-40) This method undoubtedly produced requirements excessive in some amounts, for it is not to be supposed that all canals, if open would have always taken a full supply.

The historical diversions in the section are shown in Wyoming's Exhibits 95, 86-94, and 144-145. These exhibits cover the period from 1929 to 1940, and Wyoming's Exhibit 146 gives the means for the ten-year period 1931-1940. The annual and May-September diversions and interceptions of the 26 canals are given as follows:

	Annual	May-September
Total diversion	153,130	140,770
Interception	34,650	33,110
Total diversion and interception	187,780	173,880

These figures compare substantially with corresponding averages which may be computed from Columns 64 and 71 of United States Exhibits 271 and 273.

In urging a diversion rate of 2.6 a.f.a., Wyoming lays stress upon the total resulting water supply, including rainfall and irrigation water, and in that connection again relies upon the testimony of Professor Russell, witness for Nebraska (1106-7), that 29 inches of rainfall fifty per cent of the time is adequate for crop production. As against this Nebraska makes two points: *First*, that Professor Russell's testimony related to eastern Nebraska. I do not so understand it. The whole subject of Professor Russell's testimony was irrigation in western Nebraska. It is to the effect that the rainfall in eastern Nebraska (29 inches fifty per cent of the time) would be sufficient for maximum crop production in the area where irrigation is practiced. If there be differences in soil requiring more moisture in western than eastern Nebraska, Professor Russell did not

recognize them in his testimony. *Second,* Nebraska suggests that not all rainfall is useful. This point has undoubted merit. Rainfall may be so light as to be valueless and it may be so heavy that the value cannot be measured by the quantity. That Professor Russell was familiar with these facts affirmatively appears from his testimony. It must be presumed that in giving his opinion he took them into consideration.

Wyoming calls attention to the fact that an annual supply of 34.9 inches (consisting of 1.56 a.f.a. irrigation water plus the Scottsbluff annual precipitation of 16.18 inches) exceeds the annual rainfall of 26.88 inches at Saint Paul, Minnesota, 32.71 inches at Beloit, Wisconsin, 31.44 inches at Dubuque, Iowa, 36.72 inches at St. Louis, Missouri, 25.47 inches at Omaha, Nebraska, and 34.71 inches at Leavenworth, Kansas, these points being all in humid areas. There may, of course, be differences of soil and climate as between these areas and western Nebraska materially affecting the water requirements of the land. Whether the rainfall habits respecting percentages falling in light showers and downpours at these points differ essentially from those in western Nebraska may be a question. It might be thought that a supply consisting partly of rainfall and partly of irrigation water would be better than the same quantity all in the form of precipitation. Irrigation water, when available, can be applied at the will of the irrigator.

With a history of diversions extending over a period sufficiently long to include years representative of high, low, and intermediate conditions of supply and demand, the maximum diversion of the period for any canal may safely be taken as the limit of the canal's requirement. Thus, in the 1928-1940 period there was the variety of

conditions encountered during the dry cycle and also the experience of three successive years outside the influence of that cycle. It should be permissible to assume that in at least some year during the thirteen the relation between supply and demand was such that the diversions of a canal can be looked to as furnishing a fair test of its need.

The diversion rate heretofore adopted for Wyoming private canals and Gering was 2.67 and for Mitchell 2.57. It would seem evident that the requirement for the present section cannot be higher than for these canals. There probably are differences in proper diversion rates for the different canals in the section. But except in few instances the evidence does not take account of such differences. The diversion requirements, therefore, will be computed at the rate of 2.6 acre feet per acre, except where the evidence affirmatively indicates this to be either excessive or insufficient, in which case the requirement will be determined upon the best evidence the record affords.

Since Nebraska now concedes that the land served by diversions east of Bridgeport need not participate in interstate distribution, the following detailed review of the evidence will be limited to the canals in the section diverting between Tri-State Dam and Bridgeport.

ENTERPRISE CANAL

This canal has an appropriation of 79.06 second feet with a priority of March 28, 1899. The average May-September diversion and interception for 1931-1940 (as appears from the Nebraska Biennial Reports) was 24,060, representing a rate of 4.34 for 5,534 acres. Nebraska and Wyoming agree that the land irrigated is 5,534 acres. United States does

not concur, but offers no alternative estimate. This acreage will be adopted, which at a rate of 2.6 a.f.a. calls for a total headgate requirement of 14,380 acre feet.

WINTERS CREEK CANAL

Priority November 18, 1888, for 72.01 second feet, covering claimed acreage of 5,041. Nebraska's Exhibit 463 describes 4,494 acres said to have been irrigated in 1937. (9771-7) There is no evidence that a larger acreage was ever irrigated in any other one year, and this may be taken to represent currrent demand. At 2.6 the total headgate requirement is 11,700 acre feet. The average interception for the 1931-1940 period was 11,380 acre feet (W-146), but from Nebraska's Exhibit 468 it appears that a portion, perhaps 29 per cent, as claimed by Nebraska, of the acreage shown on Exhibit 463, or 1,300 acres, is above all drain interception. The river requirement for such 1,300 acres, at 2.6, would be 3.380 acre feet. This may be taken to be the demand on the river, leaving 8,320 acre feet to be supplied from interceptions. The interceptions are more than sufficient for this, having in the past averaged 11,380 acre feet. Incidentally, Nebraska's Exhibit 466 shows that out of a total farm gate delivery of 12,555 acre feet in 1937, only 2,831 acre feet were drawn from the North Platte River. This would be approximately 21 per cent. According to this exhibit the average farmgate delivery for the year was 2.83 a.f.a. for 7,437 acres. Also the exhibit makes it appear that the loss between headgate and farmgate was 25 per cent. The average May-September diversion and interception for the period 1931-1940 was 16,490 acre feet, which would show an average diversion rate of 3.67 a.f.a.

CENTRAL CANAL

This canal has a priority of June 23, 1890, for 31.33 second feet, covering a claimed acreage of 2,193.29. The canal has a Warren Act contract calling for 4,050 acre feet.

Nebraska's Exhibit 501 purports to show acreage irrigated in 1937 of 1,598.43 acres. The Secretary of the District, however, testified that this was taken from the assessment record, and he admitted lack of personal knowledge as to whether this acreage was actually irrigated (11486, 11490). Substantially the same lands were assessed for many years previous to 1937 (11486, 11491). Railroad lands are assessed and carried as irrigated. (11493) Aside from the assessment record there is no definite evidence as to the acreage actually irrigated. 1,598.43 acres appears to be the maximum allowable. 1,600 acres at 2.6 gives a total diversion requirement of 4,160 acre feet, slightly in excess of the Warren Act Contract quantity. The average historical diversion for 1931-1940 was 6,080 acre feet, which would supply 3.8 per acre for 1600 acres.

MINATARE CANAL

Priority January 14, 1888, for 103.17 second feet, covering a claimed acreage of 7,222.2 acres. Nebraska's Exhibit 453 shows "water stock" in good standing covering 6,910 acres and stock not in good standing covering 312.2 acres. In general, each share of stock represents a right to irrigate 80 acres. (9032) Nebraska's Exhibit 453 shows actually 90½ shares in good standing, and at the rate mentioned this would cover 7,240 acres. Counsel for Nebraska, however, agreed that Exhibit 453 represented only 6,910 acres (9140). Wyoming concedes this acreage.

This canal had all the water it wanted prior to six or seven years ago (testimony in January, 1938), but since that time has been short (9138-9). Other testimony was as to a sufficiency up to 1933 (9225). The ditch has never been closed in the last twenty years (9143), but has been regulated to its appropriation (9226). The diversions in 1928, 1929, and 1930 were respectively 11,975, 10,563, and 12,399. The average for the 1931-1940 period was 17,570.

The acreage found is 6,900, which at the 2.6 rate calls for a total headgate diversion of 17,940 acre feet.

STEAMBOAT CANAL

Priority October 22, 1895, for 5.71 second feet for 400 acres. The ditch has taken no water from the river since 1930 (15060-1, 15067-8, 15071). Since that time about 200 acres have been irrigated from general seepage water and 200 acres from water carried by the Castle Rock Canal (15063-4). The demand on the river will be considered 520 acre feet to serve 200 acres.

CASTLE ROCK CANAL

Priority April 18, 1889, for 82.57 second feet for 6,047.4 acres. At the rate of one second foot for 70 acres, the appropriation would supply 5,780 acres.

Nebraska's Exhibit 459, the assessment roll for 1937, lists 6,047.4 "acres irrigated". This roll was based upon a survey made in 1912 and includes the total acreage that could be irrigated. (9271) The figures for "acres irrigated" are correct "to the satisfaction of the land owners and the Board of Directors", but it is fairly clear from testimony that the acres listed are those assessed rather than

necessarily those irrigated (9284-6, 9286-93, 9309). There is some testimony as to areas possibly not irrigated (9319-25, 9338-9). Other witnesses, however, testified broadly that the 6,047.4 acres listed on Exhibit 459 were acutally irrigated. The demand acreage will be taken to be 6,000 acres, for which the total headgate requirement will be 15,600 acre feet.

NINE-MILE CANAL

Priority December 6, 1893, for 76.4 second feet for a claimed acreage of 5,348.21, with optional diversion from Nine-Mile Draw under Application 1431 (11528, 11602, 11640, 11645).

Nebraska's Exhibit 503, taken from the assessment record of the District (11584), purports to show acres irrigated in 1937 aggregating 3,911.71 and other acres irrigated during the preceding ten years aggregating 1,436.5, or a total of 5,348.21. The land described on this exhibit "for the most part is irrigated". (11600) The acreage assessed has remained constant for a number of years (11584). Less than ten per cent is not irrigated (11601). Land indicated on 503 as being irrigated in 1937 was all irrigated (11654). This is probably to some extent guesswork (11663, et seq.). Lands on pages 8 and 9 were all irrigated except a few tracts with which witness was not familiar (11690). The total acreage sub-irrigated of the lands listed on page 6 of Exhibit 503 appears to be 219 acres. As to one forty the comment is that part is sub-irrigated and "balance has been irrigated". A witness testified as to the whole quarter section that it had not used any water for several years (11605). Sheet 10 lists 72 acres, with the comment that they are low and were sel-

dom irrigated in recent years. There is another 21 acres on page 6 "irregularly watered" that is questionable. 5,000 acres should cover the current demand under this canal, with a total headgate diversion of 13,000 acre feet. This compares with historical diversions in 1928 of 8,848, 1929 of 12,014, and 1930 of 9,130, and an average 1931-1940 of 10,750, of which 250 was intercepted.

SHORT LINE CANAL

Priority May 1, 1893, for 42.05 second feet covering a claimed acreage of 2,943.6. Nebraska's Exhibit 507, made up from the assessment records of the district, was introduced by the president of the board (11797-8), who was sure that the entire acreage shown (2,943 acres) was irrigated except 14.25 acres irrigated off and on but not in 1937, and 23.91 acres not irrigated since he was in office, and possibly not since 1933 (11798-11801). The land is all second bottom land and used for native hay or pasture except one section (11806-7-11815). Ninety per cent of the hay land is watered (11812). Outside of 1934 there was no serious shortage as far as the hay land was concerned (11839). The capacity of the ditch is less than 42 second feet, but could carry 35 or 36 second feet (11844-5). According to the testimony, 2,300 acres is hay land, of which 90 per cent, or 2,070 acres, is irrigated. It does not appear whether the 14.25 and the 23.91 acre tracts are hay land or crop land. Assuming they are in the ten per cent of hay land not irrigated, the total irrigated land, including the section of crop land, would be 2,710 acres—say 2,700 acres—for which the headgate allowance would be 7,020 acre feet, computed at the rate of 2.6. However, this supply cannot be justified on the basis of historical diversions.

The testimony was that generally speaking there was an ample supply of water for this canal from the Nine-Mile Drain (11803-4, 11839); that the exception to this was a serious shortage in 1934 (11805) and minor shortages in 1935 (11838), 1936 (11806), and 1937 (11838). Notwithstanding the opportunities for diversion thus indicated, it appears that during the fifteen years 1928 to 1942, inclusive, the largest diversion was in 1939—5,334 acre feet—and that in only three years during the fifteen did the diversions exceed 4,500 acre feet, the other two years being 1937, 4,862 acre feet, and 1932, 4,725 acre feet. The only year in which there was any substantial diversion outside of the May-September period was in 1937 when there were 960 acre feet diverted in October and November. Examples of the pre-dry cycle period diversions are 1928, 2915 acre feet; 1929, 3113 acre feet; 1930, 3815 acre feet. This record appears to call for an allotment of about 4,500 acre feet. This would exceed the 1931-1940 average by 800 acre feet, and would exceed the 1931-1933 average by 170 acre feet.

CHIMNEY ROCK CANAL

Priority December 3, 1890, for 60 second feet for a claimed acreage of 6,094.5 acres. The effect of the decree for this canal is to limit the diversions to one second foot for each 100 acres. (13245)

Nebraska's Exhibit 461 lists a total of 5,123.5 acres as having been irrigated in 1937, and 485.5 acres as having been irrigated prior to 1931, but not in 1937. This 5,609 acres was said to be the total acreage of the district (9582). The exhibit is based upon acreage actually irrigated (9525); the number of acres "we levy a tax on to irrigate"

(9526). The lands listed on the first six pages (5,123 acres) were irrigated in 1937 (9533). Prior to 1927 there was lots of water; after 1931 there were shortages (9534, 9556). But the first year of shortage to amount to anything was 1935. In that year the ditch was cut down to less than one-half its appropriation. In 1936 there was no water at all, the language of the witness being: "In 1936 we were shut off entirely and we didn't have any water at all." (9542) However, the Nebraska Biennial Reports show diversions in 1935 of 8,173 acre feet in May-September and 4,032 in October-April, total 12,205, and in 1936, 11,658 in May-September and 1,711 in October-April, total 13,369. During some of the years between 1925 and 1930 no irrigation water was applied because there was plenty of rain (9596, 9609). The district has a Warren Act contract for a maximum of 10,300 acre feet. For 5,000 acres the 2.6 rate would yield 13,000 acre feet, which should be more than sufficient to satisfy the current demand of this canal. Only once in the fifteen-year period from 1928 to 1942 did the May-September diversion exceed 12,500 acre feet, and only twice did the total annual diversions exceed that figure. 12,500 acre feet should be ample.

ALLIANCE CANAL

Priority December 26, 1892, for 63.53 second feet, covering a claimed acreage of 4,447. The evidence indicates a demand acreage of approximately 3,900 acres and 10,100 acre feet requirement, being computed at the 2.6 rate. However, the sole source of supply for the canal is Bayard Drain, no water having been diverted directly from the river since 1925. (4228).. There is no basis for any finding

as to when, if ever, the demand will again be transferred to the river. The canal, therefore, cannot be treated as a river demand.

EMPIRE CANAL

Priority June 25, 1891, for 22.43 second feet for 1570 acres, and one of July 20, 1907, for one second foot for 70 acres; total 1640 acres.

The water for this canal is carried through the Belmont (11852). Nebraska's Exhibit 508, made up from the records of the company and the personal knowledge of the secretary (11856), shows 1500 acres irrigated in 1937 and 140 other acres irrigated in previous years (11857). But there was less irrigation in previous years than in 1937 (11929). The conclusion is that 1500 acres is the largest amount of land irrigated in one year. At 2.6 this would call for a headgate diversion of 3900 acre feet. However, in the fifteen-year period from 1928 to 1942 the largest recorded diversion of this canal was 2,906 acre feet in 1937, and the next largest was 2,386 acre feet in 1933. The low diversion rate in relation to acreage is probably due to the fact that the land is devoted almost exclusively to native hay (4172). A headgate of 2,400 acre feet would be large in comparison with historical diversions, but may be warranted.

BELMONT CANAL

Priority December 19, 1889, for 118.74 second feet for 8,112 acres. Wyoming, Nebraska, and Colorado stipulated to an acreage of 8,312 acres, apparently 200 acres in excess of the appropriation.

The lands are near the river bottom and the water table is close to the surface (11770). They are devoted mostly to native hay (11771). The needs of the land are similar to others "around here * * * up and down the river on both sides". The district had a reasonable run of water the last few years. No crops were lost in 1937 for want of water (11760-3). Farmers have been known to allow water to run on the farms longer than necessary (11764). Mr. Willis thought that on account of the length of the canal and sandy soil there was need for more than one second foot for every seventy acres (11768-9). The acreages reported for this canal have for some reason been extraordinarily large, running from 13,700 up to as high as 22,000 acres. The diversions have been from 16,000 acre feet up to about 38,000 acre feet per year. The length of the canal, which is 45 miles (4317), argues for a larger headgate allowance than other canals in the section, but on the other hand the fact that most of the irrigation is of native hay argues for moderation. An allotment of 24,000 acre feet would be at the rate of nearly three a.f.a., and may be about right. This will be an exception to the otherwise uniform rate of 2.6 where the headgate is based upon acreage and rate.

SCHERMERHORN CANAL

Priority October 5, 1897, for 5.71 second feet for 400 acres. 400 acres are irrigated with water from Camp Clark seep and Red Willow Drain, carried by Alliance Canal to the Schermerhorn. The diversion works at the river have fallen into disuse and decay, and no water has been taken directly from the river for about ten years. (15077-82)

Four hundred acres at 2.6 gives 1,040 acre feet headgate. However, the canal will not be considered a demand on the river.

LOGAN CANAL

Priority October 17, 1889, for 2.54 second feet covering 178 acres. Nebraska, Wyoming, and Colorado stipulated this to be the acreage irrigated. The canal is but one mile long. Applying the 2.6 rate gives a headgate of 460 acre feet.

WATER LOSSES UNDER KENDRICK PROJECT.

A conclusion was heretofore reached that a diversion of 160,000 acre feet per season would be adequate to supply this project. This assumed substantial elimination of certain possible losses anticipated in some of the testimony.

In Exhibits 261 and 262 of the United States Mr. Dibble allows for a loss of 9,600 acre feet annually (4,700 May-September, 4,900 October-April) because of expected drainage into sumps (29196-97). After the testimony of Mr. Matthews, construction engineer for the project, explaining drainage constructed and contemplated, Mr. Dibble lowered his estimate of this loss and conceded that the winter loss might be wholly eliminated. He did not give his reduced estimate for the summer loss (28585, 29175).

Mr. Matthews testified that drainage works had already been constructed which would eliminate the loss by reason of the sumps on the first unit (28507-8). For the second unit preliminary drainage plans had been drawn, and Mr. Matthews expected construction to follow. However, he

thought it would not be economically feasible to construct drainage that would entirely eliminate loss into the sumps on the second unit (28510-4). I see no basis for revising Mr. Dibble's original estimate unless it would be according to the reduction in the sump area. Mr. Matthews testified that there were 900 acres of such area in the first unit and 2,750 in the second, or a total of 3,650, and he estimated that there would remain in the second unit, unrelieved by drainage, an area of 750 acres (28516). If the reduction in loss were proportionate to the acreage, this would mean that 80 per cent of the loss has been or will be eliminated by drainage. This would reduce Mr. Dibble's loss figure to 1,920 acre feet a year. Mr. Matthews testified that the drainage will not only reduce the flowage of Kendrick Project water into the sumps but will largely increase the flowage into the river of water from natural precipitation. He said, for example, that in August, 1941, on the occasion of a cloudburst, the drainage works returned to the river approximately 1500 acre feet that would otherwise have gone into the sumps. It may be that the benefit thus resulting to the river will offset the comparatively small loss of irrigation water that will find its way into the sumps on the second unit after the construction of the drainage works.

On U. S. Exhibit 262 Mr. Dibble estimates a further loss of return flow before reaching Guernsey of 22,000 acre feet annually. This represents in the main an estimate of diversions of the return flow water, channel losses and evaporation not being considered a material item (28577-80, 29176). Mr. Matthews testified that there were about 2,000 acres of land, other than that designated by the Bureau of Reclamation as irrigable, which is so physically

located as to be irrigable from the Kendrick Project, but which is not included in the project (28504-6). As to this, Wyoming says that it is willing to agree that no lands shall be irrigated except such as are comprised within the area designated as irrigable by the Bureau of Reclamation.

LARAMIE RIVER—WHEATLAND PROJECT.

While the decree in the Laramie River case (Wyoming v. Colorado, 259 U. S. 419) is in the form of an injunction merely restraining diversions by Colorado in excess of a specified annual quantity in virtue of the Laramie-Poudre Tunnel appropriation, the underlying basis of the decree was in part the finding and assumption that the limitation upon Colorado's use would leave Wyoming 272,500 acre feet annually for the irrigation of 181,000 acres down to and including the Wheatland Project. The evidence is that less than this quantity of water has actually been available to Wyoming. The average for 1911 to 1938 was but 242,500 acre feet (W-112). Presumably, the "dependable" supply was even less than this. While Nebraska takes the position generally that not being a party to *Wyoming v. Colorado* it is not bound by the decree, the only specific point made in opposition to the distribution effected by the decree pertains to the Wheatland Project. The opinion and decree of the Supreme Court does not disclose what acreage for the Wheatland Project was included in the 181,000 acres of Wyoming land found to have a priority senior to the Laramie-Poudre Tunnel appropriation of October, 1909, but it appears that there was testimony in that case fixing the acreage between 30,000 and 33,500 acres (19089, 19091). Probably the acreage adopted by the Supreme Court was

one of these two estimates or some number of acres between them. The irrigated acreage was apparently increased subsequent to the closing of the testimony in the Laramie River case and over the last ten years (i. e. prior to November, 1939) was in the neighborhood of 49,000 acres, exclusive of the Bordeaux and the Mule Shoe tracts. It has reached 50,000 acres. In 1938 or 1939 it was about 48,000 acres (W. 75; 19032, 19038-9, 19045, 19136, 19207-9).

This project had a very slow development. The original adjudication was in 1903—twenty years after the appropriation (W-50; 18359). On appeal from this adjudication there was a judgment of the District Court in 1912. This judgment recited that 32,700 acres "have been reduced to cultivation and were actually being irrigated in the year 1909". This judgment in November, 1929, was adopted by the Wyoming Board of Control, and an order based upon it was then entered (18353-4). The judgment and this order each recited "that the time within which * * * water * * * may be applied to beneficial use without loss of priority * * * has not expired" (18353). There was a supplemental order of the Board of Control April 20, 1933, declaring the appropriation to cover 58,503 acres. This was the acreage for which certificates of appropriation have been issued (18359).

After reviewing the matter I am left in some uncertainty as to Nebraska's position respecting the Wheatland Project and the Laramie River in general. I do not find that it has been expressly urged by Nebraska that the present acreage irrigated under the Wheatland Project should be denied the 1883 priority, or if so where the line should be drawn. The other parties appear to take the view that the Laramie is

removed from the present case by the decree in *Wyoming v. Colorado*, except for such contribution as the Laramie may make to the North Platte after any use by Colorado and Wyoming permitted under the terms of that decree. In its brief (p. 195) Nebraska says:

> "It is thus clear that according to Wyoming practice a period of 46 years delay in completion of the development of an irrigation project is held to be sufficient to maintain the original priority date."

This is contrasted with Wyoming's contention respecting Tri-State. It rather suggests an acceptance of the 1883 priority for Wheatland. In its out-of-priority study Nebraska does not include Wheatland or the Laramie. I find no analysis of any claim of injury to Nebraska or of any benefit that would result from any limitation on the Wheatland project or from any adjudication in the present suit cutting down the 1883 priority. In any study of this question an important consideration would be the fact that normally about sixty per cent of the Wheatland supply is from storage (27299).

I gather that what Nebraska is really contending for is consistency of treatment as between Wheatland and Tri-State and consistency in the effect given the South Platte River compact as compared with the *Wyoming v. Colorado* decree. The Tri-State priority claimed by Nebraska has heretofore been allowed and the distribution effected by the South Platte compact is to be accepted as equitable. It may be that this disposes of any contest by Nebraska of the Wheatland priority and of any contention that the Laramie River as a whole must be reviewed in this suit regardless of the *Wyoming v. Colorado* decree.

REVIEW OF PROCEEDINGS.

The order appointing the Special Master was entered October 14, 1935. In July of 1936 the parties were ready to begin presentation of evidence, and the first session was held at Lincoln, Nebraska, July 14 to 22 of that year, at which Nebraska opened its case. It was there decided that before proceeding further with the evidence a trip of inspection and study should be made covering the North Platte and Platte Rivers and their principal irrigation and storage works from North Park, Colorado, to Grand Island, Nebraska. Participating in this was a party including the Special Master and the counsel and engineers of Nebraska, Wyoming, and Colorado. The party assembled at Denver on August 5, from whence the trip was carried out as projected, occupying nine days and furnishing an opportunity of gaining by actual observation an understanding of pertinent physical facts and conditions that could not as well have been acquired in any other way. About a year later a short two-day trip, September 16 and 17, 1937, was made for a second inspection of the Nebraska section of the river between Wyoming state line and Kearney. Some of the irrigated lands in the area were viewed. In the meantime the taking of testimony proceeded as rapidly as the parties were prepared to present it. All together twenty-four sessions were held for this purpose as follows:

1. July 14 to 22, 1936, at Lincoln, Nebraska.
2. November 9 to 16, 1936, at Lincoln, Nebraska.
3. May 6 to 17, 1937, at Lincoln, Nebraska.
4. May 19 to 22, 1937, at North Platte, Nebraska.
5. May 24 to 27, 1937, at Lincoln, Nebraska.
6. September 20 to October 13, 1937, at Lincoln, Nebraska.

7. October 15 to 20, 1937, at North Platte, Nebraska.
8. December 1 to 15, 1937, at North Platte, Nebraska.
9. January 25 to February 11, 1938, at Scottsbluff, Nebraska.
10. March 29 to April 11, 1938, at Scottsbluff, Nebraska.
11. October 25 to November 11, 1938, at Lincoln, Nebraska.
12. December 12 and 13, 1938, at Lincoln, Nebraska.
13. February 13 to 15, 1939, at Lincoln, Nebraska.
14. February 16 to 18, 1939, at Scottsbluff, Nebraska.
15. May 16 to 25, 1939, at Torrington, Wyoming.
16. July 17 to 19, 1939, at Casper, Wyoming.
17. July 21 to 29, 1939, at Rawlins, Wyoming.
18. November 7 to 24, 1939, at Cheyenne, Wyoming.
19. January 30 to February 15, 1940, at Denver, Colorado.
20. May 13 to 29, 1940, at Denver, Colorado.
21. October 7 to 23, 1940, at Denver, Colorado.
22. April 15 to 29, 1941, at Denver, Colorado.
23. July 8 to 25, 1941, at Lincoln, Nebraska.
24. November 24 to December 19, 1941, at Denver, Colorado.

After the close of evidence on December 19, 1941, the parties were allowed, at their request, a total of nine months to prepare and submit briefs. The last brief was received November 13, 1942. Their aggregate length was 2110 pages. In January, 1943, an oral argument was heard, lasting fourteen days, January 13 to 28. In attendance were all counsel for the parties and the engineers. Again in January, 1944, with similar attendance, there was a further conference and argument for five days, January 11 to 15. Following this, and between the adjournment and May 1, 1944, several additional memoranda were submitted by counsel covering specific points at issue.

Respectfully Submitted
MICHAEL J. DOHERTY

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